

JAPANESE [JP,2000-078147,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] Are the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and it sets to said each base transceiver station. The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. The wireless packet transfer approach characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

[Claim 2] The wireless packet transfer approach indicated by claim 1 which carries out the monitor of the packet transmitted from other base transceiver stations in said each base transceiver station by carrying out the shortcut of the transfer path of the shape of said tree, and is characterized by matching the base transceiver station which the wireless terminal which the transmitting agency address of said packet shows, and the sending-station address show, and registering with said table.

[Claim 3] It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction which approaches a local station in the transfer path top of the shape of said tree from other base transceiver stations in said each base transceiver station is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, The 1st number of base transceiver stations taken to relay a packet from the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows to a local station according to the transfer path of the shape of said tree, The 2nd number of base transceiver stations taken to relay a packet from the base transceiver station which matched with said transmitting agency wireless terminal, and was registered into said table to a local station according to the transfer path of the shape of said tree is compared. The wireless packet transfer approach indicated by either of claims 1 or 2 characterized by matching with said transmitting agency wireless terminal the base transceiver station which the sending-station address of the packet concerned shows on condition that the 1st number of base transceiver

stations is more than the 2nd number of base transceiver stations, and carrying out renewal of registration of said table.

[Claim 4] It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction which approaches a local station in the transfer path top of the shape of said tree from other base transceiver stations in said each base transceiver station is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, On the transfer path of the shape of said tree, the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows matches with said transmitting agency wireless terminal, and is not located between the base transceiver station under registration on said table, and a local station, Or it is contingent [the base transceiver station which said sending-station address shows / on matching with said transmitting agency wireless terminal, and being in agreement with the base transceiver station under registration on said table]. The wireless packet transfer approach indicated by either of claims 1 or 2 which match with said transmitting agency wireless terminal the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows, and are characterized by carrying out renewal of registration at said table.

[Claim 5] Are the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and it sets to said each base transceiver station. The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. The wireless packet transfer approach characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

[Claim 6] Are the packet wireless transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and it sets to said each base transceiver station. Carry out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, match the base transceiver station which the wireless terminal which the destination address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. The wireless packet transfer approach characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the

packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

[Claim 7] In said each base transceiver station, the notice packet of connection and the notice response packet of connection are defined. Said notice packet of connection and said notice response packet of connection In the base transceiver station which it had path information field in the data division, and said path information field showed the transfer sequence of said all base transceiver stations of having transmitted the packet concerned, and was newly connected to the tree-like transfer path In said adjoining base transceiver station which transmitted said notice packet of connection to the base transceiver station which adjoins on a tree-like transfer path, and received said notice packet of connection Grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice packet of connection concerned from said path information field, and a tree-like transfer path is updated. Moreover, input the transmitting agency address of the notice packet of connection concerned into the destination address of the notice response packet of connection, and said notice response packet of connection is transmitted. The address of a local station is transmitted to all the base transceiver stations that adjoin said path information field of the notice packet of connection concerned on the transfer path of the shape of a tree except the base transceiver station which carries out an additional input, and which the sending-station address of said notice packet of connection shows. Set to the base transceiver station which received said notice response packet of connection, grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice response packet of connection concerned from said path information field, and a tree-like transfer path is updated. The wireless packet transfer approach indicated by claim 1 thru/or any of 6 they are. [which is characterized by carrying out an additional input and transmitting the address of a local station to the path information field of the notice response packet of connection concerned when the destination address of the notice response packet of connection concerned is not in agreement with the address of a local station]

[Claim 8] In said each base transceiver station, a connection addition packet and the notice packet of a path are defined as the packet which transmits between said base transceiver stations. Said connection addition packet Have the connection base transceiver station field in the data division, and said connection base transceiver station field shows the address of the base transceiver station which the transmitting agency base transceiver station of the connection addition packet concerned newly connected. Said notice packet of a path has the path information table field in the data division. Said path information table field In the base transceiver station which showed the mutual physical relationship between the base transceiver stations on the transfer path of the shape of a tree which the transmitting agency base transceiver station of the packet concerned grasps, and was newly connected to the tree-like transfer path In the base transceiver station which received said connection addition packet made into transmitting [the base transceiver station which transmits said connection addition packet to addressing to a base transceiver station which connected the channel, and adjoins on a tree-like transfer path] origin Said notice packet of a path is transmitted to the transmitting agency base transceiver station of the connection addition packet concerned. Moreover, the connection addition packet concerned is transmitted to the base transceiver station which adjoins on a tree-like transfer path except the base transceiver station which the sending-station address of the notice packet of connection concerned shows. In the base transceiver station which received said connection addition packet which makes it a transmitting agency except the base transceiver station which adjoins on a tree-like transfer path The transmitting agency base transceiver station of said notice packet of connection grasps having connected the base transceiver station which the connection base transceiver station field of said connection addition packet shows, and the channel, and updates a tree-like transfer path. Moreover, transmit said connection addition packet to all the base transceiver stations that adjoin on the transfer path of the shape of a tree except the base transceiver station which the sending-station address of said connection addition packet shows, and it sets to the base transceiver station which received said notice packet of a path. The wireless packet transfer

approach indicated by claim 1 thru/or any of 6 they are. [which is characterized by grasping the location on the transfer path of the shape of a tree of other base transceiver stations from said path information table field, and updating a tree-like transfer path]

[Claim 9] In said each base transceiver station, the notice packet of cutting is defined as the packet which transmits between said base transceiver stations. Said notice packet of cutting Have the cutting base transceiver station field in data division, and it sets to said each base transceiver station. When it has the function to detect cutting of a channel with the base transceiver station which adjoins on a tree-like transfer path and cutting of a channel with said adjoining base transceiver station is detected, In the base transceiver station which inputted the address of said adjoining base transceiver station into said cutting base transceiver station field, transmitted said notice packet of cutting to all the base transceiver stations on a tree-like transfer path, and received said notice packet of cutting The wireless packet transfer approach indicated by either of claims 7 or 8 characterized by grasping what the channel between the base transceiver station which said cutting base transceiver station field shows, and the transmitting agency base transceiver station of said notice packet of cutting cut, and updating a tree-like transfer path.

[Claim 10] The wireless packet transfer approach indicated about the packet transmitted by broadcasting in said each base transceiver station by claim 1 characterized by carrying out the shortcut of the tree-like transfer path, and not transmitting thru/or either of 9.

[Claim 11] The wireless packet transfer approach indicated by claim 1 characterized by deleting registration of the wireless terminal concerned registered into said table when the period which was able to define beforehand the wireless terminal under registration on said table after registering a wireless terminal into said table after renewal of registration passes in said each base transceiver station thru/or either of 9.

[Claim 12] It is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the sending-station address show, The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. Carry out the shortcut of the transfer path of the shape of said tree to the base transceiver station chosen as said destination, and a packet is transmitted. The base transceiver station characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

[Claim 13] It is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the receiving station address show, The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and is registered into said

table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. The base transceiver station characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

[Claim 14] It is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the destination address of a packet shows, and the sending-station address show, The monitor section which carries out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, matches the base transceiver station which the wireless terminal which the destination address of the packet concerned shows, and the sending-station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. The base transceiver station characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the direction same in view of a local station as said root station when the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the base transceiver station using the wireless packet transfer approach and this approach in a wireless packet communication network.

[0002]

[Description of the Prior Art] As a conventional technique 1 of the packet transfer approach, there is the transfer approach using a spanning tree protocol as indicated by reference "ISO/IEC10038, ANSI/IEEE Std802.1D, "Information technology-Telecommunications and information exchange between systems-Local area networks-Media access control(MAC) bridges", 1993."

[0003] According to this approach, a path cost (Pathcost) is beforehand set as all base transceiver stations (AP), and one specific base transceiver station is set as a root station. Here, total of the path cost of a certain base transceiver station, a root station, and the base transceiver station on the communication path of a between is called root run cost. A root station transmits periodically the configuration message (Configuration Message) which set the MAC (Media Access Control) address of a local station as the transmitting agency address. This configuration message has the root run field, and a root station sets the root run cost field as "0", and transmits.

[0004] The base transceiver station immediately after starting receives the fixed period and configuration message defined beforehand, out of two or more configuration messages which received, chooses a configuration message with the smallest root run cost, and sets up a channel to the transmitting agency base transceiver station of the selected configuration message.

[0005] Moreover, the path cost of a local station is added to the root run cost of the selected configuration message, the MAC Address of a transmitting agency address local station is set up, and a configuration message is transmitted. By the above, a configuration message is spread to all base transceiver stations, and a base transceiver station connects a communication path in the shape of a tree with a root station as the starting point.

[0006] According to this approach, it is prevented that the packet transfer to all base transceiver stations is enabled, and a transfer packet carries out the loop formation of between base transceiver stations when a base transceiver station carries out the packet transfer of the communication-path (tree-like transfer path) top connected in the shape of a tree.

[0007] Next, as a conventional technique 2 of the packet transfer approach, there is the transfer approach using a source routing protocol as indicated by reference "ISO/IEC 8802-5, "Information technology-Local and metropolitan networks-Part 5:Token ring access method and physical layer specifications", 1992."

[0008] According to this approach, a wireless terminal (STA) carries out blow cast transmission of the retrieval frame which contains the MAC Address of a destination terminal first, when transmitting a data packet. The destination terminal which received the retrieval frame carries out broadcasting transmission of all the path planning frames that gave the MAC Address of a transmit terminal. The base transceiver station which received all path planning frames writes in

the identifier of a local station, and transmits it to other base transceiver stations.

[0009] A transmit terminal copies the permutation of the identifier of the wireless terminal written in all the path planning frames that chose two or more received path planning frames of all, and were chosen as the header unit of a data packet as routing information, and transmits. If a data packet is received, a base transceiver station will choose the base transceiver station used as the next destination based on the routing information directed to the header unit of a packet, will transmit a data packet, and will transmit even a destination wireless terminal.

[0010] Next, the grasp approach of the location of the base transceiver station on the transfer path of the shape of a tree using a source routing protocol is considered. By this approach, the base transceiver station newly connected to the tree-like transfer path carries out broadcasting transmission of the retrieval frame. Each base transceiver station which received the retrieval frame carries out broadcasting transmission of all the path planning frames. The base transceiver station newly connected to the tree-like transfer path grasps the location on the transfer path of the shape of a tree of other base transceiver stations from all the received path planning frames.

[0011] On the other hand, other base transceiver stations which received the retrieval frame carry out broadcasting transmission of the retrieval frame containing the MAC Address of the transmitting agency base transceiver station of the retrieval frame concerned, i.e., the base transceiver station newly connected to the tree-like transfer path. The base transceiver station newly connected to the tree-like transfer path transmits all path planning frames to each retrieval frame transmitting former base transceiver station. By the above, other base transceiver stations grasp the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path.

[0012]

[Problem(s) to be Solved by the Invention] By the way, in order to build a transfer path in the shape of a tree with a root station as the starting point according to the packet transfer approach concerning the above-mentioned conventional technique 1, For example, although a base transceiver station AP 4 and a base transceiver station AP 3 are able to carry out direct communication when it is constituted in the shape of a tree, as a transfer path shows drawing 8 The packet transfer to a base transceiver station AP 3 is performed by the path "AP4-AP1-AP2-AP3" from a base transceiver station AP 4. For this reason, a transfer path becomes redundant and the problem of the fall of the throughput by the increment in transfer delay time amount and consumption of a wireless resource arises.

[0013] Moreover, in drawing 8, if the packet transfer to a base transceiver station AP 3 is performed from a base transceiver station AP 4, the loop formation of the transfer packet is carried out in a path "AP4-AP3-AP2-AP1-AP4", multiple-times reception of the same packet will be carried out, or the problem of the fall of the throughput by consumption of a wireless resource will arise.

[0014] Moreover, when according to the packet transfer approach concerning the above-mentioned conventional technique 2 it is constituted in the shape of a tree as a transfer path shows drawing 8 since a data packet is transmitted according to routing information for example, the packet transfer to AP3 from a base transceiver station AP 4 is directly transmitted according to a path "AP4-AP3", and does not produce the situation in which a transfer packet carries out a loop formation, either. However, all the wireless terminals that transmit a packet carry out broadcasting transmission of the retrieval frame, in order to acquire the routing information according to individual for every destination wireless terminal, and a destination wireless terminal needs to carry out broadcasting transmission by return [frames / all / path planning], and, generally they have the problem that the effect of the throughput fall by broadcasting transmission of a retrieval frame and all path planning frames becomes large in a wireless network with little transmission capacity, compared with a cable network. Moreover, since a wireless terminal needs to manage routing information for every destination wireless terminal, it also produces the problem that the load of a wireless terminal becomes large.

[0015] Moreover, when applying the packet transfer approach concerning the conventional technique 2 to grasp of the location on the transfer path of the shape of a tree of a base

transceiver station, the base transceiver station which all base transceiver stations transmitted the retrieval frame, and was newly connected to the tree-like transfer path has the problem that where of the fall of the throughput by consumption of a wireless resource arises, in order to carry out broadcasting transmission of all the path planning frames to all other base transceiver stations.

[0016] This invention was made in view of the above-mentioned situation, it can transmit a packet, without passing through a redundant transfer path, and aims at offering the base transceiver station using the wireless packet transfer approach and this approach of preventing the fall of a throughput.

[0017]

[Means for Solving the Problem] In order to carry out solution achievement of the above-mentioned technical problem, this invention has the following configurations. Namely, the wireless packet transfer approach concerning claim 1 Are the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and it sets to said each base transceiver station. The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0018] As opposed to a base transceiver station choosing only the base transceiver station which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention A base transceiver station carries out the monitor of the packet transmitted in the direction of a local station, and a transmitting agency wireless terminal and a sending-station base transceiver station are matched and registered into a table. When a destination wireless terminal is registering with a table, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path, and carry out shortcut transmission of the packet differ.

[0019] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0020] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal.

[0021] The base transceiver station which carried out the monitor of the packet transmitted in the direction of a local station in this invention It is judged as the base transceiver station

subordinate whom the sending-station address shows a transmitting agency wireless terminal, or the base transceiver station subordinate located in a local station and an opposite direction seen from the base transceiver station which the sending-station address shows. It registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0022] Moreover, a base transceiver station carries out shortcut transmission, only when a packet is received from a root station and the base transceiver station located in an opposite direction on a tree-like transfer path, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of this shortcut packet Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same on a tree-like transfer path in view of a local station as a root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0023] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames in advance of packet transmission, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0024] In said each base transceiver station, the wireless packet transfer approach concerning claim 2 carries out the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree, and is characterized by matching the base transceiver station which the wireless terminal which the transmitting agency address of said packet shows, and the sending-station address show, and registering with said table.

[0025] In this invention, it adds to a base transceiver station carrying out the monitor of the packet of the direction of a local station. Carry out the monitor of the packet transmitted by shortcut, and it is judged as the base transceiver station subordinate whom the sending-station address shows a transmitting agency wireless terminal, or the base transceiver station subordinate located in a local station and an opposite direction seen from the base transceiver station which the sending-station address shows. It registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table By carrying out shortcut transmission to the base transceiver station matched, the effectiveness that it can prevent that the transfer path of a packet grows into redundancy, and the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0026] The wireless packet transfer approach concerning claim 3 is set to said each base transceiver station. It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree from other base transceiver stations is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, The 1st number of base transceiver stations taken to relay a packet from the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows to a local station according to the transfer path of the shape of said tree, The 2nd number of base transceiver stations taken to relay a packet from the base transceiver station which matched with said transmitting agency wireless terminal, and was registered into said table to a local station according to the transfer path of the shape of said tree is compared. It is characterized by matching with said transmitting agency wireless terminal on condition that the 1st number of base transceiver stations is more than the 2nd number of base transceiver stations, and carrying out renewal of registration of said table.

[0027] In this invention, it becomes possible [the base transceiver station which carried out the

monitor of the packet] to increase more the amount of redundancy reduction of the transfer path by shortcut transmission by matching with the wireless terminal of transmitting [the larger base transceiver station of tree path distance] origin, and registering with a shortcut table, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0028] The wireless packet transfer approach concerning claim 4 is set to said each base transceiver station. It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree from other base transceiver stations is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, On the transfer path of the shape of said tree, the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows matches with said transmitting agency wireless terminal, and is not located between the base transceiver station under registration on said table, and a local station, Or it is contingent [the base transceiver station which said sending-station address shows / on matching with said transmitting agency wireless terminal, and being in agreement with the base transceiver station under registration on said table]. The base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows is matched with said transmitting agency wireless terminal, and it is characterized by carrying out renewal of registration at said table.

[0029] In this invention, the base transceiver station which carried out the monitor of the packet When the base transceiver station which the sending-station address shows matches with a transmitting agency wireless terminal and is not located between the base transceiver station under registration on a table, and a local station on a tree-like transfer path The effectiveness of preventing a base transceiver station continuing carrying out shortcut transmission based on the information before wireless terminal migration is acquired by judging it as what the wireless terminal moved to the subordinate of another base transceiver station, and carrying out renewal of registration of the table.

[0030] Moreover, the larger base transceiver station of tree path distance can be matched with a transmitting agency wireless terminal, it can register with a table, the amount of redundancy reduction of the transfer path by shortcut transmission is increased more, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0031] The wireless packet transfer approach concerning claim 5 is the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and is set to said each base transceiver station. The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0032] As opposed to a base transceiver station choosing only the base transceiver station

which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention. The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. When a destination wireless terminal and a sending-station base transceiver station are matched and registered into a table and a destination wireless terminal is registering with a table, on a tree-like transfer path, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin, and carry out shortcut transmission of the packet differ.

[0033] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0034] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal.

[0035] The base transceiver station which carried out the monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits in this invention. A transmitting agency wireless terminal judges it as the wireless base subordinate whom the sending-station address shows, and it registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table. By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0036] Moreover, a base transceiver station carries out shortcut transmission, only when a packet is received from a tree-like transfer path top root station and the base transceiver station located in an opposite direction, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of this shortcut packet. Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same in view of a local station as a tree-like transfer path top root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0037] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames in advance of packet transmission, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0038] The wireless packet transfer approach concerning claim 6 is the packet wireless transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and is set to said each base transceiver station. Carry out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, match the base transceiver station which the wireless terminal which the destination address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the

packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0039] As opposed to a base transceiver station choosing only the base transceiver station which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention A base transceiver station carries out the monitor of the packet which other base transceiver stations transmit to the subordinate's wireless terminal. When a destination wireless terminal and a sending-station base transceiver station are matched and registered into a table and a destination wireless terminal is registering with a table, on a tree-like transfer path, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin, and carry out shortcut transmission of the packet differ.

[0040] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0041] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal.

[0042] The base transceiver station where other base transceiver stations carried out the monitor of the packet which transmits to a wireless terminal in this invention A destination wireless terminal judges it as the wireless base subordinate whom the sending-station address shows, and registers with a shortcut table. At the time of a packet transfer, when a destination wireless terminal is registered on a shortcut table By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0043] Moreover, a base transceiver station carries out shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction on a tree-like transfer path, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of a shortcut packet Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same on a tree-like transfer path in view of a local station as a root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0044] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without carrying out broadcasting transmission of a retrieval frame or all path planning frames, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0045] The wireless packet transfer approach concerning claim 7 is set to said each base transceiver station. The notice packet of connection and the notice response packet of connection are defined. Said notice packet of connection and said notice response packet of connection In the base transceiver station which it had path information field in the data division,

and said path information field showed the transfer sequence of said all base transceiver stations of having transmitted the packet concerned, and was newly connected to the tree-like transfer path In said adjoining base transceiver station which transmitted said notice packet of connection to the base transceiver station which adjoins on a tree-like transfer path, and received said notice packet of connection Grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice packet of connection concerned from said path information field, and a tree-like transfer path is updated. Moreover, input the transmitting agency address of the notice packet of connection concerned into the destination address of the notice response packet of connection, and said notice response packet of connection is transmitted. The address of a local station is transmitted to all the base transceiver stations that adjoin said path information field of the notice packet of connection concerned on the transfer path of the shape of a tree except the base transceiver station which carries out an additional input, and which the sending-station address of said notice packet of connection shows. Set to the base transceiver station which received said notice response packet of connection, grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice response packet of connection concerned from said path information field, and a tree-like transfer path is updated. When the destination address of the notice response packet of connection concerned is not in agreement with the address of a local station, it is characterized by carrying out an additional input and transmitting the address of a local station to the path information field of the notice response packet of connection concerned.

[0046] This invention transmits the notice packet of connection which has the path information field where the base transceiver station which newly connected to a tree-like transfer path shows the hysteresis of the base transceiver station to which the packet transmitted, and other base transceiver stations on the transfer path of the shape of a tree which received this notice packet of connection differ from the conventional technique from said path information field in the point of grasping the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path.

[0047] In order that according to this invention other base transceiver stations can grasp the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path and other base transceiver stations may not transmit a path planning frame by the notice packet of connection, the effectiveness of shortening time amount until it grasps the effectiveness and physical relationship which prevent the fall of a throughput is acquired.

[0048] The wireless packet transfer approach concerning claim 8 is set to said each base transceiver station. A connection addition packet and the notice packet of a path are defined as the packet which transmits between said base transceiver stations. Said connection addition packet Have the connection base transceiver station field in the data division, and said connection base transceiver station field shows the address of the base transceiver station which the transmitting agency base transceiver station of the connection addition packet concerned newly connected. Said notice packet of a path has the path information table field in the data division. Said path information table field In the base transceiver station which showed the mutual physical relationship between the base transceiver stations on the transfer path of the shape of a tree which the transmitting agency base transceiver station of the packet concerned grasps, and was newly connected to the tree-like transfer path In the base transceiver station which received said connection addition packet made into transmitting [the base transceiver station which transmits said connection addition packet to addressing to a base transceiver station which connected the channel, and adjoins on a tree-like transfer path] origin Said notice packet of a path is transmitted to the transmitting agency base transceiver station of the connection addition packet concerned. Moreover, the connection addition packet concerned is transmitted to the base transceiver station which adjoins on a tree-like transfer path except the base transceiver station which the sending-station address of the notice packet of connection concerned shows. In the base transceiver station which received said connection addition packet which makes it a transmitting agency except the base transceiver station which

adjoins on a tree-like transfer path. The transmitting agency base transceiver station of said notice packet of connection grasps having connected the base transceiver station which the connection base transceiver station field of said connection addition packet shows, and the channel, and updates a tree-like transfer path. Moreover, transmit said connection addition packet to all the base transceiver stations that adjoin on the transfer path of the shape of a tree except the base transceiver station which the sending-station address of said connection addition packet shows, and it sets to the base transceiver station which received said notice packet of a path. It is characterized by grasping the location on the transfer path of the shape of a tree of other base transceiver stations from said path information table field, and updating a tree-like transfer path.

[0049] This invention transmits the connection addition packet in which the newly connected base transceiver station includes the connection base transceiver station field which shows the MAC Address of a connection place base transceiver station to a connection place base transceiver station to a tree-like transfer path. Other base transceiver stations on the transfer path of the shape of a tree which received this connection addition packet. It grasps that the transmitting agency base transceiver station, i.e., the base transceiver station newly connected to the tree-like transfer path, connected with the base transceiver station which said connection base transceiver station field shows. The base transceiver station newly connected to the transfer path of the shape of said tree in which the notice packet of a path was received differs from the conventional technique in the point of grasping the location on the transfer path of the shape of a tree of said other base transceiver stations, from said path information field.

[0050] According to this invention, the effectiveness shorten more time amount in order for the base transceiver station newly connected to the tree-like transfer path to be able to grasp the location of the base transceiver station of ** on a tree-like transfer path and not to require transmission of the notice response packet of connection of other base transceiver stations, until it grasps the effectiveness and the physical relationship which controls consumption of a wireless resource further and prevents the fall of a throughput more by the notice packet of a path is acquired.

[0051] The wireless packet transfer approach concerning claim 9 defines the notice packet of cutting as the packet which transmits between said base transceiver stations in said each base transceiver station. Said notice packet of cutting. Have the cutting base transceiver station field in data division, and it sets to said each base transceiver station. When it has the function to detect cutting of a channel with the base transceiver station which adjoins on a tree-like transfer path and cutting of a channel with said adjoining base transceiver station is detected, in the base transceiver station which inputted the address of said adjoining base transceiver station into said cutting base transceiver station field, transmitted said notice packet of cutting to all the base transceiver stations on a tree-like transfer path, and received said notice packet of cutting. It is characterized by grasping what the channel between the base transceiver station which said cutting base transceiver station field shows, and the transmitting agency base transceiver station of said notice packet of cutting cut, and updating a tree-like transfer path.

[0052] According to this invention, it is effective in becoming possible to grasp the base transceiver station cut from the tree-like transfer path, being matched with the base transceiver station concerned by the notice packet of cutting, and being able to suspend shortcut transmission to the wireless terminal under registration on a table by it.

[0053] The wireless packet transfer approach concerning claim 10 is characterized by carrying out the shortcut of the tree-like transfer path, and not transmitting about the packet transmitted by broadcasting, in said each base transceiver station. According to this invention, the effectiveness that it is prevented that the packet transmitted by broadcasting carries out a loop formation, and it prevents multiple-times reception of the same packet and the fall of a throughput is acquired by not carrying out shortcut transmission of the broadcasting packet.

[0054] In said each base transceiver station, the wireless packet transfer approach concerning claim 11 is characterized by deleting registration of the wireless terminal concerned registered into said table, when the period which was able to define beforehand the wireless terminal under registration on said table after registering a wireless terminal into said table after renewal of

registration passes. According to this invention, when a wireless terminal ends a communication link, registration of a table can be deleted in the period defined beforehand, and the effectiveness which controls the amount of memory which a table takes is acquired.

[0055] The base transceiver station concerning claim 12 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the sending-station address show, The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. Carry out the shortcut of the transfer path of the shape of said tree to the base transceiver station chosen as said destination, and a packet is transmitted. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0056] The base transceiver station concerning claim 13 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the receiving station address show, The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0057] The base transceiver station concerning claim 14 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the destination address of a packet shows, and the sending-station address show, The monitor section which carries out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, matches the base transceiver station which the wireless terminal which the destination address of the

packet concerned shows, and the sending-station address show, and is registered into said table. With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0058]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained, referring to a drawing. Drawing 1 is the outline block diagram showing the description section of a base transceiver station AP used with the wireless packet communication network concerning the gestalt of this operation. It has the description for the base transceiver station AP shown in this drawing to be arranged at each node of a wireless packet communication network in which the transfer path was formed in the shape of a tree for example, by the spanning tree protocol, carry out the shortcut of the tree-like transfer path, and transmit a packet.

[0059] In addition, about other functions, it is the same as that of the usual base transceiver station. For example, when a packet is received from other base transceiver stations, or when a packet is received from the wireless terminal under attribution, while a packet is transmitted to this terminal while the destination wireless terminal of said packet is belonging to a local station and a destination wireless terminal is not belonging to a local station, a packet is transmitted to the base transceiver station which is the next destination.

[0060] In drawing 1, the packet monitor section 1 (monitor section) carries out the monitor of the packet transmitted in the direction which approaches a local station in a tree-like path [transfer] top, and registers into the shortcut table 2 (table) the wireless terminal and base transceiver station which transmit the packet concerned. The base transceiver station which the wireless terminal which the transmitting agency address of the packet (namely, packet transmitted in the direction which approaches in the direction of a local station) by which the monitor was carried out shows, and the sending-station address show is matched mutually, and is registered into the shortcut table 2.

[0061] The packet transfer section 3 (transfer section) transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station, and has the function to carry out the shortcut of the transfer path (tree-like transfer path) of normal, and to transmit a packet, by referring to the shortcut table 2. In addition, each base transceiver station and each wireless terminal have the address (MAC Address) of an equipment proper as an identifier.

[0062] A format of the packet transmitted to drawing 2 with the wireless packet communication network concerning the gestalt of this operation is shown. As shown in this drawing, each packet consists of data divisions which input the header unit which inputs a control signal, and transfer data. Packet A is used for the transfer packet from a wireless terminal to a base transceiver station, and has the header unit which consists of "format classification", the "receiving station address", the "transmitting agency address", a "destination address", and "reservation."

[0063] Moreover, Packet B is used for the packet transfer between base transceiver stations, and has the header unit which serves as "format classification" from four kinds of address fields, the "receiving station address", the "sending-station address", a "destination address", and the "transmitting agency address." Packet C is used for the transfer packet from a base transceiver station to a wireless terminal, and has the header unit which consists of "format classification",

a "destination address", the "sending-station address", the "transmitting agency address", and "reservation."

[0064] Here, a destination address shows the MAC Address of the wireless terminal of the destination of a packet, the transmitting agency address shows the MAC Address of the transmitting agency wireless terminal of a packet, the receiving station address shows the MAC Address of the base transceiver station of the destination (base transceiver station which receives a packet from a current base transceiver station), and the sending-station address shows the MAC Address of the base transceiver station of the source (base transceiver station which transmits a packet to a current base transceiver station).

[0065] Moreover, the below-mentioned notice packet of connection and the packet for the notice response of connection which are used when a base transceiver station is newly connected to a wireless packet communication network have path information field, respectively, and the MAC Address of a base transceiver station which relayed the packet concerned to the head is inputted into this path information field in order of junction in the MAC Address of a transmitting agency base transceiver station.

[0066] Next, about basic actuation of the base transceiver station concerning the gestalt of this operation, the wireless packet communication network which makes the transfer path of the shape of a tree shown in below-mentioned drawing 7 and below-mentioned drawing 8 is made into an example, and is explained along with the flow chart shown in drawing 3 - drawing 6. Here, in drawing 7, although the transfer path is not set up between base transceiver stations AP3 and AP7, base transceiver stations AP3 and AP4, and base transceiver stations AP3 and AP6, there is no shelter of an electric wave among each other, and a mutual transmitting packet makes a monitor possible.

[0067] Moreover, the number of the base transceiver stations for junction required when the shape of a tree carries out the transfer path top packet transfer of between two wireless bases is defined as the "tree path distance" between base transceiver stations. For example, in drawing 8, base transceiver stations AP3 and AP7 and the tree path distance of a between are 3, and base transceiver stations AP3 and AP4 and the tree path distance of a between are 2. Moreover, seen from a certain base transceiver station, the direction of a root station on a tree-like transfer path is made into the direction of a high order, and an opposite direction is made into the direction of low order.

[0068] Hereafter, basic actuation of each base transceiver station is explained. In addition, in the following basic actuation, about the actuation which carries out the monitor of the packet, and is registered and updated at the shortcut table 2, it is mainly carried out by the packet monitor section 1, and is mainly carried out by the packet transfer section 3 about the actuation which determines the destination with reference to the shortcut table 2. Moreover, various kinds of other control / judgment actuation is realized by functions other than packet monitor section 1 and packet transfer section 3. However, it is not necessary to necessarily assign as a function of the packet monitor section 1 or the packet transfer section 3, and you may realize on software as a function of a base transceiver station about these functions (basic actuation).

[0069] (Basic actuation 1) Each base transceiver station receives the packet which a surrounding base transceiver station transmits, and carries out the monitor of the packet B (step S01). When the monitor of the packet B is carried out here (step S02: YES), the base transceiver station where the base transceiver station (sending station AP) which the sending-station address of this packet shows adjoins on a tree-like transfer path -- not but (step S03: NO) And this packet B is a packet (the direction packet of a local station) transmitted in the direction of a local station (step S04: YES). If the wireless terminal of a transmitting agency has not been registered (step S05: NO), the base transceiver station of a transmitting agency will be matched with the sending station AP of the packet concerned, it will register with the shortcut table 2 (claim 1, 12 reference), and a registration hold timer will be started (step S06). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path (step S03: YES), it does not register.

[0070] (Basic actuation 2) It is judged that each base transceiver station is the case where the base transceiver station (receiving station AP) which the sending station AP and the receiving

station address of Packet B show does not adjoin on a tree-like transfer path, and it is the packet (shortcut packet) by which shortcut transmission was carried out when it is not the packet of the direction of a local station (step S04: NO) (step S07: YES).

[0071] If the wireless terminal (the transmitting agency STA) of a transmitting agency has not been registered at this time (step S05: NO), the transmitting agency STA will be matched with a sending station AP, and it will register with the shortcut table 2 (claim 2 reference). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path, it does not register. Moreover, a registration hold timer is started at the time of shortcut table registration.

[0072] (Basic actuation 3) When the transmitting agency STA is registering each base transceiver station into the shortcut table 2 (step S05: YES), The tree path distance between a local station and a sending station AP (the 1st number of base transceiver stations) When it is beyond the tree path distance between the base transceiver stations matched with the wireless terminal under a local station and registration (the 2nd number of base transceiver stations) (step S08: YES), renewal of registration is carried out, using the base transceiver station matched as a sending station AP (claim 3 reference). (step S09) A registration hold timer is restarted at the time of renewal of registration.

[0073] (Basic actuation 4) When each base transceiver station is not located on the transfer path of the shape of a tree between the base transceiver stations and local stations by which the sending station AP is matched with the wireless terminal under registration on the shortcut table 2, Or when in agreement with the base transceiver station matched with the wireless terminal under registration (under registration STA) (step S08: YES), renewal of registration of the base transceiver station matched is carried out in a sending station AP (claim 4 reference). (step S09) A registration hold timer is restarted at the time of renewal of registration. In addition, the above-mentioned basic actuation 3 and the above-mentioned basic actuation 4 are not performed to coincidence, but either is chosen beforehand.

[0074] (Basic actuation 5) Each base transceiver station carries out the monitor of the packet C which surrounding AP transmits (step S01:NO- step S10:YES), and registers the wireless terminal (destination STA) and sending station AP of the destination into the shortcut table 2 (claim (steps S11-S13) 6, 14 reference). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path (step S11: YES), it does not register. When Destination STA is registered (step S12: YES), renewal of registration of the shortcut table 2 is carried out (step S14), and a registration hold timer is restarted.

[0075] (Basic actuation 6) Each base transceiver station carries out the monitor of the packet A which a surrounding wireless terminal transmits (step S01:NO- step S10:NO), and registers a receiving station AP into the shortcut table 2 the transmitting agency STA (claim (steps S20-S23) 5, 13 reference). However, when a receiving station AP is an adjoining base transceiver station on a tree-like transfer path (step S21: YES), it does not register. When the transmitting agency STA is registered (step S22: YES), renewal of registration of the shortcut table 2 is carried out (step S24), and a registration hold timer is restarted.

[0076] (Basic actuation 7) Each base transceiver station transmits Packet B one by one by making into a receiving station AP all the base transceiver stations that adjoin on the transfer path of the shape of a tree except the sending station AP of a receive packet while carrying out broadcasting transmission to (step S31:YES) and the wireless terminal under attribution when a receiving station AP is a local station (step S30: YES), and a receive packet is a broadcasting packet (step S32). However, the transfer by shortcut is not performed in this case (claim 10 reference). It prevents that the packet transmitted by broadcasting carries out the loop formation of the path top by this.

(Basic actuation 8) Each base transceiver station transmits Packet A to (step S33:YES) and Destination STA, when Destination STA is a wireless terminal under attribution in a local station subordinate (common to all (step S34) claims).

[0077] (Basic actuation 9) When each base transceiver station receives Packet A from the wireless terminal under attribution (step S35: YES), Or when Packet B is received from the base transceiver station (low order AP) of the direction of low order (step S36: YES), When

Destination STA is registering with the shortcut table 2, shortcut transmission of the packet B is carried out in this base transceiver station by making (step S37:YES) and the base transceiver station matched into a receiving station AP (step S38). In not registering, Packet B is transmitted to all the base transceiver stations that adjoin on the transfer path of (step S37:NO) and the shape of a tree except a sending station AP one by one (common to all (step S39) claims).

[0078] (Basic actuation 10) Each base transceiver station transmits Packet B to the base transceiver station (low order AP) of (step S40:YES) and the direction of low order, when a shortcut packet is received (common to all (step S41) claims). Since a packet is not transmitted to a high order AP at this time, generating of a loop formation is prevented.

(Basic actuation 11) When a receive packet is not a shortcut packet when Packet B is received from the base transceiver station (high order AP) of the direction of a high order namely, (step S40: NO), Packet B is transmitted to all the base transceiver stations that adjoin on the transfer path of the shape of a tree except a sending station AP one by one (step S42). Since the shortcut transfer of the receive packet from a high order AP is not carried out at this time, generating of a loop formation is prevented.

[0079] (Basic actuation 12) Each base transceiver station has the registration hold corresponding to each wireless terminal under registration on the shortcut table 2 by 1 to 1, and measures the continuation sheep time of delivery of the packet for updating registration of each wireless terminal. When the time amount defined beforehand passes not carrying out renewal of registration of the wireless terminal concerned after each base transceiver station measures continuation sheep time of delivery with a registration hold timer and a certain wireless terminal is registered and a registration hold timer becomes a time-out (step S50), registration of the wireless terminal (corresponding STA) is deleted from the shortcut table 2 (claim (step S51) 11 reference).

[0080] Moreover, each base transceiver station performs the following basic actuation in order to connect / cut a channel to the wireless packet communication network which consists of a tree-like transfer path.

(Basic actuation 13) Each base transceiver station defines the notice packet of connection, and the notice response packet of connection. When it newly connects with a tree-like transfer path, input the transfer sequence of a base transceiver station into the notice packet of connection, and other base transceiver stations are told about the location of the local station on a tree-like transfer path. Moreover, when the notice packet of connection is received, the transmitting agency address of the notice packet of connection concerned is inputted into the destination address of the notice response packet of connection, and other base transceiver stations are told about the location of a local station (claim 7 reference).

[0081] (Basic actuation 14) When each base transceiver station defined the notice packet of a path which shows the mutual physical relationship between the connection addition packet which shows the newly connected address of a base transceiver station, and a base transceiver station, transmits a connection addition packet to addressing to a base transceiver station which connected the channel, and transmits it to each of other base transceiver station and a path addition packet receives, the notice packet of a path transmits to the transmitting agency base transceiver station of a connection addition packet, and the location of a local station tells about (claim 8 reference).

[0082] (Basic actuation 15) Each base transceiver station has the function to detect cutting of a channel with the base transceiver station which adjoins on a tree-like transfer path. The notice packet of cutting which shows that the channel was cut is defined as the packet which transmits between base transceiver stations. When this notice packet of cutting is transmitted to all the base transceiver stations on a tree-like transfer path and the notice packet of cutting is received, what the channel between the base transceiver stations which this packet shows cut is grasped (claim 9 reference).

[0083] Next, actuation of each base transceiver station is explained to be the example of a configuration of the wireless packet communication network by the base transceiver station which has above-mentioned basic actuation. The example of arrangement of the base

transceiver station which starts the gestalt of this operation at drawing 7 is shown. In this drawing, the wireless terminal STA 3 shall belong to a base transceiver station AP 3, the wireless terminal STA 5 belongs to a base transceiver station AP 5, the wireless terminal STA 1 shall belong to a base transceiver station AP 1, and the wireless terminal STA 7 shall belong [the wireless terminal STA 6 shall belong to a base transceiver station AP 6, and] to the base transceiver station AP 7. Moreover, let the graphic form part to which the slash was given be the field where the shelter of an electric wave shall be expressed and the transfer path between base transceiver stations is not set up in this drawing.

[0084] Generally, in wireless LAN, such as a wireless packet communication network, each base transceiver station (AP) transmits periodically the beacon signal which gave the MAC Address of a local station into a self-cel. Each wireless terminal (STA) transmits an imputed signal to the transmitting agency AP of a beacon signal. The base transceiver station which received this makes the transmitting agency STA of an imputed signal under attribution, and performs transmission of the packet to the wireless terminal under this attribution, and reception/transfer of the packet from this wireless terminal. Each base transceiver station may notify the completion of imputed to a wireless terminal for the improvement in dependability.

[0085] When it constitutes a wireless packet communication network, each base transceiver station sets up a tree-like transfer path with a spanning tree protocol by making a specific base transceiver station into a root station. However, in drawing 7, a root office is made into a base transceiver station AP 1, and all the path costs of each base transceiver station are taken as the same value. Then, each base transceiver station grasps the location on the transfer path of the shape of a tree of other base transceiver stations, and builds the information about a transfer path.

[0086] Here, in drawing 7, the case where a base transceiver station AP 7 is newly connected to a tree-like transfer path is made into an example, and the case where the above-mentioned basic actuation 13 (claim 7 reference) is used as the construction approach of the information about a transfer path is explained. In this case, a base transceiver station AP 7 transmits the notice packet of connection for notifying having connected with the base transceiver station AP 4 to a base transceiver station AP 4. The base transceiver station AP 4 which received this carries out the additional input of the MAC Address of a local station in the path information field of the notice packet of connection, and transmits it to the base transceiver stations AP 1 and AP 6 which adjoin this notice packet of connection while it transmits the notice response packet of connection for notifying having received the notice packet of connection to a base transceiver station AP 7.

[0087] It is transmitted like the following, the notice packet of connection transmitted from the base transceiver station AP 7 is transmitted to all base transceiver stations, and each base transceiver station which received this transmits the notice response packet of connection to a base transceiver station AP 7. Each MAC Address of base transceiver stations AP 7, AP 4, AP 1, AP 2, and AP 3 is inputted into the path information field of this result, for example, the notice packet of connection which a base transceiver station AP 5 receives, in order. Moreover, the newly connected base transceiver station AP 7 gets to know the location on the transfer path of the shape of a tree of each base transceiver station by the notice response packet of connection from other base transceiver stations. Moreover, other base transceiver stations get to know the location of a base transceiver station AP 7 by the notice packet of connection. The transfer path of the shape of a final tree set up by each base transceiver station which uses a spanning tree protocol for drawing 8, and is shown in drawing 7 is shown.

[0088] Next, in drawing 7, the case where the above-mentioned basic actuation 14 is used as other construction approaches (claim 8 reference) of the information about a transfer path when a base transceiver station AP 7 is newly connected to a tree-like transfer path (base transceiver station 4) is explained. According to this approach, a base transceiver station AP 7 transmits the connection addition packet showing additional connection having been made to a base transceiver station AP 4 to a base transceiver station AP 4. The base transceiver station AP 4 which received this transmits the connection addition packet concerned to the adjoining base transceiver stations AP 1 and AP 6, and transmits the notice packet of a path to a base

transceiver station AP 7.

[0089] The connection addition packet transmitted from the base transceiver station AP 7 is transmitted to all base transceiver stations, and other base transceiver stations which received the connection addition packet grasp that the base transceiver station AP 7 connected the channel between base transceiver stations AP 4. A base transceiver station AP 7 gets to know the location on the transfer path of the shape of a tree of other base transceiver stations from the path information table field of the notice packet of a path. This path information table field is expressed as a list of MAC Addresses of each base transceiver station on the basis of the transmitting agency base transceiver station of for example, a path information table packet. for example, the path information table field which a base transceiver station AP 4 transmits -- ***** (AP (AP4, AP6)4, AP1, AP2, AP3, AP5) -- it is expressed.

[0090] Hereafter, the actuation in the case of carrying out the shortcut of the transfer path in the wireless packet communication network (tree-like transfer path) shown in drawing 8, and transmitting a packet is explained as actuation of the base transceiver station concerning the gestalt of this operation. The shortcut of the tree-like transfer path is carried out to drawing 9 by making the communication link between the wireless terminals STA7 and STA3 into an example, and the transmitting example 1 which carries out packet transmission is shown. However, in an initial state, one shall not be registered into the shortcut table 2 of all base transceiver stations for the wireless terminal.

[0091] First, the case where the wireless terminal STA 7 transmits a packet to the wireless terminal STA 3 is explained. If the packet addressed to wireless terminal STA3 is transmitted from the wireless terminal STA 7, the base transceiver station AP 7 where the wireless terminal STA 7 belongs will transmit a packet to the base transceiver station AP 4 which the destination wireless terminal STA 3 is not belonging Packet A from the wireless terminal STA 7 at the time of reception, and adjoins in a tree-like transfer path since un-***** [the wireless terminal STA 3 / the shortcut table 2]. A base transceiver station AP 3 carries out the monitor of the packet B which a base transceiver station AP 7 transmits, since the direction of transfer of the packet transmitted to AP1 from a base transceiver station AP 7 is the direction of a local station, registers into the shortcut table 2 the base transceiver station AP 7 which is the wireless terminal STA 7 and sending station of a transmitting agency, and starts a registration hold timer.

[0092] A base transceiver station AP 4 transmits a packet to the base transceiver stations AP1 and AP6 which the wireless terminal STA 3 is not belonging, and adjoin in a tree-like transfer path since un-***** [a shortcut table]. Although the packet which a base transceiver station AP 3 carries out the monitor of the packet which a base transceiver station AP 4 transmits, and is transmitted to AP1 from a base transceiver station AP 4 is the direction of a local station, since the wireless terminal STA 7 of a transmitting agency is shortcut table registering and the base transceiver station AP 4 which is a sending station is located between the base transceiver station AP 7 under tree-like registration on a transfer path, and a local station, registration of a shortcut table is not updated.

[0093] The packet from a base transceiver station AP 4 is transmitted to a base transceiver station AP 3 via base transceiver stations AP1 and AP2, and a base transceiver station AP 3 transmits Packet C to the wireless terminal STA 3. A base transceiver station AP 3 carries out the monitor of the packet C which transmits to the wireless terminal STA 3, a base transceiver station AP 7, and AP4 and AP6 match the base transceiver station AP 3 which are the destination wireless terminal STA 3 and a sending station, they register it into the shortcut table 2, and they start a registration hold timer. By the above, the packet transmitted from the wireless terminal STA 7 is received by the wireless terminal STA 3.

[0094] Then, the case where the wireless terminal STA 3 transmits a packet to the wireless terminal STA 7 after this is explained. In this case, since a base transceiver station AP 3 is the packet which the wireless terminal STA 7 was registering with the shortcut table, and received from the wireless terminal under attribution, it carries out the shortcut of the transfer path (AP in this case 3-AP2-AP1-AP4-AP7) of the shape of an original tree, and transmits it to a base transceiver station AP 7 directly.

[0095] Since a base transceiver station AP 7 is in agreement with the base transceiver station

AP 3 whose base transceiver station where the wireless terminal STA 3 of the transmitting origin of the packet (shortcut packet) transmitted by shortcut is shortcut table registering, and is matched is a sending station, it restarts a registration hold timer and transmits Packet C to the wireless terminal STA 7. By the above, the packet transmitted from the wireless terminal STA 3 is received by the wireless terminal STA 7. The contents of each final shortcut table 2 of the base transceiver stations AP3, AP4, AP6, and AP7 in the above-mentioned transmitting example 1 are shown in drawing 10.

[0096] The shortcut of the tree-like transfer path is carried out to drawing 11 by making the communication link between the wireless terminal STA 6 and the wireless terminal STA 3 into an example, and the transmitting example 2 which carries out packet transmission is shown. However, in an initial state, the contents of each shortcut table 2 of base transceiver stations AP3, AP4, AP6, and AP7 shall be shown in above-mentioned drawing 10, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal. Moreover, a base transceiver station AP 3 makes possible the monitor of the packet which the wireless terminal STA 6 transmits.

[0097] If Packet A is transmitted to a base transceiver station AP 6 from the wireless terminal STA 6, a base transceiver station AP 3 will carry out the monitor of this packet A, will register into the shortcut table 2 the base transceiver station AP 6 which is the wireless terminal STA 6 and receiving station of a transmitting agency, and will start a registration hold timer. Since the base transceiver station AP 6 which received the packet is the packet which the destination terminal STA 3 of Packet A was registering with the shortcut table 2, and received from the base transceiver station under attribution, it carries out shortcut transmission of the packet B to the base transceiver station AP 3 matched.

[0098] Since the base transceiver station of the base transceiver station AP 3 which received this packet where the wireless terminal STA 6 of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched corresponds with the base transceiver station AP 6 of a transmitting agency, it restarts a registration hold timer and transmits Packet C to the wireless terminal STA 3. Since base transceiver stations AP4 and AP6 are in agreement with the base transceiver station AP 3 whose base transceiver station where the destination wireless terminal STA 3 of Packet C is registering with the shortcut table 2, and is matched is a sending station, they restart a registration hold timer. By the above, the packet transmitted from the wireless terminal STA 6 is received by the wireless terminal STA 3.

[0099] Then, the case where the wireless terminal STA 3 transmits a packet to the wireless terminal STA 6 after this is explained. In this case, since a base transceiver station AP 3 is the packet which the wireless terminal STA 6 was registering with the shortcut table 2, and received from the wireless terminal under attribution, it carries out shortcut transmission to a base transceiver station AP 6. Since a base transceiver station AP 6, and AP4 and AP7 are in agreement with the base transceiver station AP 3 whose base transceiver station where the wireless terminal STA 3 of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched is a sending station, a registration hold timer is restarted and a base transceiver station AP 6 transmits Packet C to the wireless terminal STA 7. By the above, the packet transmitted from the wireless terminal STA 3 is received by the wireless terminal STA 6. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in the above-mentioned transmitting example 2 are shown in drawing 12.

[0100] The shortcut of the tree-like transfer path is carried out to drawing 13 by making the communication link between the wireless terminal STA 5 and the wireless terminal STA 6 into an example, and the transmitting example 3 which carries out packet transmission is shown.

However, in an initial state, the contents of each shortcut table 2 of base transceiver stations AP3, AP4, AP7, and AP6 shall be shown in above-mentioned drawing 12, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal.

[0101] if Packet A is transmitted to the wireless terminal STA 6 from the wireless terminal STA 5, the base transceiver station AP 5 which received this will transmit Packet B to all the base transceiver stations (here -- a base transceiver station AP 3) where the destination terminal STA 6 of Packet A adjoins in a tree-like transfer path not under attribution (it is un-registering

to an imputed table) but since un-**** [the shortcut table 2] moreover.

[0102] Since it receives from the base transceiver station where the packet B which received is located in an opposite direction to a root office and the wireless terminal STA 6 of the destination is registering a base transceiver station AP 3 into the shortcut table 2, it carries out shortcut transmission to the base transceiver station AP 6 matched. If a shortcut packet is received, a base transceiver station AP 6 will register into the shortcut table 2 the base transceiver station AP 3 which is the wireless terminal STA 5 and sending station of a transmitting agency, and will start a registration hold timer.

[0103] Moreover, base transceiver stations AP4 and AP7 carry out the monitor of the shortcut packet which a base transceiver station AP 6 transmits, register into the shortcut table 2 the base transceiver station AP 3 which is the wireless terminal STA 6 and sending station of a transmitting agency, and start a registration hold timer. Next, a base transceiver station AP 6 transmits the packet C which received to the wireless terminal STA 6. Since a base transceiver station AP 3 is in agreement with the base transceiver station AP 6 whose base transceiver station which the monitor of this packet C is carried out, and the destination wireless terminal STA 6 is registering with the shortcut table 2, and is matched is a sending station, it restarts a registration hold timer.

[0104] Then, the case where the wireless terminal STA 6 transmits a packet to the wireless terminal STA 5 after this is explained. In this case, since a base transceiver station AP 3 is in agreement with the base transceiver station AP 6 whose base transceiver station which the monitor of the packet A transmitted from the wireless terminal STA 6 is carried out, and the wireless terminal STA 6 of a transmitting agency is registering with the shortcut table 2, and is matched is a sending station, it restarts a registration hold timer.

[0105] Since a base transceiver station AP 6 is the packet which the wireless terminal STA 5 was registering with the shortcut table 2, and received from the wireless terminal under attribution, it carries out shortcut transmission to the base transceiver station AP 3 matched. Since the base transceiver station AP 3 which received this is in agreement with the base transceiver station AP 6 whose base transceiver station where the base transceiver station AP 6 which is the wireless terminal STA 6 and sending station of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched is a sending station, it starts a registration hold timer.

[0106] Next, it is not and the wireless terminal STA 5 of the destination is not belonging, and since un-**** [a base transceiver station AP 3 / the shortcut table 2], it transmits Packet B to the base transceiver station AP 5 which are a tree-like transfer path top root station and a contiguity station of an opposite direction. This prevents that a transfer packet carries out the loop formation of the path "AP3 ->AP2 ->AP1 ->AP4 ->AP3." However, a path "AP4 ->AP3" is a path by shortcut transmission.

[0107] Although the monitor of the packet B transmitted from a base transceiver station AP 3 is carried out, since it is not the direction of a local station, a base transceiver station AP 4, and no AP6 and AP7 are carried out. The base transceiver station AP 5 which received the packet transmits Packet C to the wireless terminal STA 5. By the above, the packet transmitted from the wireless terminal STA 6 is received by the wireless terminal STA 5. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in the above-mentioned transmitting example 3 are shown in drawing 14.

[0108] Next, the transmitting example which transmits a packet without carrying out the shortcut of the tree-like transfer path to drawing 15 by making the communication link between the wireless terminal STA 1 and the wireless terminal STA 3 into an example is shown. However, in an initial state, the contents of each shortcut table of base transceiver stations AP3, AP4, AP7, and AP6 shall be shown in above-mentioned drawing 14, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal.

[0109] If the packet A addressed to wireless terminal STA3 is transmitted from the wireless terminal STA 1, the base transceiver station AP 1 which received this will transmit a packet to the base transceiver stations AP2 and AP4 which it is not and the wireless terminal STA 3 of the destination is not belonging, and adjoin on a tree-like transfer path since un-**** [the

shortcut table 2]. The base transceiver station AP 2 which received this is transmitted to a base transceiver station AP 3, and transmits a base transceiver station AP 3 to the wireless terminal STA 3.

[0110] On the other hand, although the wireless terminal STA 3 is registering [be / it] into the shortcut table 2 the base transceiver station AP 4 which received the packet from the base transceiver station AP 1, in order that the packet B which received may receive from the base transceiver station of the direction of a high order, the transfer by shortcut is not performed to a base transceiver station AP 3. It is prevented that it is received by the wireless terminal STA 3 and only one side of the packet transmitted towards base transceiver stations AP2 and AP4 from the base transceiver station AP 1 receives the packet with the same wireless terminal STA 3 twice by this.

[0111] Next, an example of operation (renewal of registration of a shortcut table) when the wireless terminal STA 7 which belonged to drawing 16 in the base transceiver station AP 7 moves to the subordinate of a base transceiver station AP 6 is shown. The wireless terminal STA 7 transmits a packet via a base transceiver station AP 6. Since the monitor of the packet A which the wireless terminal STA 7 transmits is carried out, and the wireless terminal STA 7 is registering with a shortcut table and the base transceiver station AP 6 which is a receiving station is not located between the tree-like transfer path top base transceiver station AP 7 (under registration), and a local station, a base transceiver station AP 4 changes matching into a base transceiver station AP 6, and starts a registration hold timer.

[0112] When a base transceiver station AP 4 cannot carry out the monitor of the packet A transmitted from the wireless terminal STA 7, the monitor of the packet B transmitted from a base transceiver station AP 6 is carried out, and matching of a shortcut table is changed similarly. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in this example are shown in drawing 17.

[0113] Next, the example in which the wireless terminal STA 7 which moved to the subordinate of a base transceiver station AP 6 transmits a packet to drawing 18 with a broadcasting method is shown. When transmitting a packet by broadcasting, transmission by carrying out the shortcut of the transfer path is not performed, but the transfer path top of the shape of a tree which is an original transfer path is transmitted to a packet. That is, in this example, a base transceiver station AP 6 will transmit this to the adjoining base transceiver station AP 4, if a packet is received from the wireless terminal STA 7.

[0114] The base transceiver station AP 4 which received this is transmitted to the adjoining base transceiver stations AP1 and AP7. A base transceiver station AP 1 transmits the packet transmitted from the base transceiver station AP 4 to a base transceiver station AP 2, a base transceiver station AP 2 transmits this to a base transceiver station AP 3, and a base transceiver station AP 3 transmits this to a base transceiver station AP 5. The packet transmitted from the wireless terminal STA 7 is transmitted to all base transceiver stations by the above.

[0115] Finally, the actuation at the time of cutting a tree-like transfer path is described. Each base transceiver station is judged to be that from which the channel with the base transceiver station which emits the beacon signal concerned was cut, when the base transceiver station which adjoins on the transfer path of the shape for example, of a tree supervises the beacon signal transmitted periodically and cannot carry out N time (N: threshold defined beforehand) reception of this beacon signal continuously.

[0116] For example, in above-mentioned drawing 7, when the blocker occurs among base transceiver stations AP4 and AP7 and a base transceiver station AP 4 cannot receive the beacon signal from a base transceiver station AP 7, a base transceiver station AP 4 is judged to be what the channel with a base transceiver station AP 7 cut, and the notice packet of cutting as which the MAC Address of a base transceiver station AP 7 was inputted into the "cutting base transceiver station field" is transmitted to base transceiver stations AP6 and AP1.

[0117] The base transceiver station AP 1 which received this is transmitted to a base transceiver station AP 2, and the notice packet of cutting is transmitted to all base transceiver stations like the following. When what the channel with base transceiver stations AP7 and AP4

cut each base transceiver station which received the notice packet of cutting for is got to know and the wireless terminal under registration on a shortcut table is matched with the base transceiver station AP 7, the registration is deleted and transmission by shortcut is suspended. [0118] As mentioned above, although 1 operation gestalt of this invention was explained, this invention is not restricted to this operation gestalt, and even if the design change of the range which does not deviate from the summary of this invention etc. occurs, it is included in this invention. For example, although each base transceiver station shall have the shortcut table 2, this shortcut table is good also as what only two or more specific base transceiver stations have, and only two or more base transceiver stations of these specification may constitute it from a gestalt of above-mentioned operation as what can make shortcut transmission.

[0119]

[Effect of the Invention] According to this invention, the following effectiveness can be acquired as explained above. Namely, the monitor of the packet transmitted in the direction approaching a local station in a tree-like path [transfer] top is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and it registers with a table. Since the destination is chosen with reference to a table, the shortcut of the transfer path of the shape of said tree is carried out and it was made to transmit when a packet was received A packet can be transmitted without passing through a redundant transfer path, and the effectiveness of preventing the increment in transfer delay time amount and the fall of a throughput is acquired.

[0120] Moreover, since it was made not to choose as the destination the base transceiver station located in the direction (the direction of a high order of a tree-like transfer path) same in view of a local station as a root station when the packet transmitted by carrying out the shortcut of the tree-like transfer path from other base transceiver stations was transmitted, it can prevent that a transfer packet carries out a loop formation, and the effectiveness of preventing multiple-times reception of the same packet and the fall of a throughput is acquired. And without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames, shortcut transmission is attained and the effectiveness that the increment in a control load of a throughput fall and a wireless terminal can be prevented is acquired.

[0121] Moreover, the 1st number of base transceiver stations taken to relay a packet from the base transceiver station which the sending-station address of a packet shows to a local station, Since the 2nd number of base transceiver stations taken to relay a packet from the base transceiver station which matched with the transmitting agency wireless terminal and was registered into the table to a local station is compared and the table was updated It becomes possible to increase more the amount of redundancy reduction of the transfer path by shortcut transmission, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented more effectively is acquired.

[0122] Moreover, in said each base transceiver station, since the base transceiver station which the sending-station address of a packet shows updated the table according to the location on a tree-like transfer path, the effectiveness that it can prevent that a base transceiver station continues carrying out shortcut transmission based on the information before a wireless terminal moves is acquired.

[0123] Moreover, since registration of the wireless terminal concerned registered into said table was deleted when the period which was able to define beforehand the wireless terminal under registration on said table after registering a wireless terminal into a table after renewal of registration passed When a wireless terminal ends a communication link, after it becomes possible to delete registration of a table after progress of the period defined beforehand and a wireless terminal moves in a base transceiver station, it becomes possible to delete unnecessary information. Therefore, the effectiveness it is ineffective to it being possible to control the amount of memory which a table takes is acquired.

[0124] Moreover, the notice response packet of connection which shows the location of the notice packet of connection which shows the transfer sequence of a base transceiver station, and a local station defines, the location on the transfer path of the shape of a tree of a transmitting agency base transceiver station grasps from the notice packet of connection, and

since it made transmit to the base transceiver station input and adjoin the address of a local station to the notice response packet of connection, in order for other base transceiver stations not to transmit a path-planning frame, the effectiveness that the fall of a throughput can prevent is acquired.

[0125] Moreover, the notice packet of a path which shows the mutual physical relationship between the base transceiver stations on the transfer path of the shape of the connection addition packet which shows the newly connected address of a base transceiver station, and a tree is defined. Since the base transceiver station newly connected to the tree-like transfer path transmits a connection addition packet and the base transceiver station which received the connection addition packet transmitted the notice packet of a path to the transmitting agency base transceiver station of the connection addition packet concerned Transmission of the notice response packet of connection of other base transceiver stations cannot be required, but consumption of a wireless resource can be controlled further, and the effectiveness that the fall of a throughput can be prevented more effectively can be acquired. And the effectiveness that time amount until it grasps the physical relationship on a tree-like transfer path can be shortened more can be acquired.

[0126] Moreover, since the address of an adjoining base transceiver station is inputted into the notice packet of cutting and it was made to transmit to all base transceiver stations when the notice packet of cutting was defined and cutting of a channel with an adjoining base transceiver station was detected, each base transceiver station becomes possible [grasping the base transceiver station cut from the tree-like transfer path], and the effectiveness that the shortcut transmission to this base transceiver station can be stopped is acquired.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the base transceiver station using the wireless packet transfer approach and this approach in a wireless packet communication network.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] As a conventional technique 1 of the packet transfer approach, there is the transfer approach using a spanning tree protocol as indicated by reference "ISO/IEC10038, ANSI/IEEE Std802.1D, "Information technology-Telecommunications and information exchange between systems-Local area networks-Media access control(MAC) bridges", 1993."

[0003] According to this approach, a path cost (Pathcost) is beforehand set as all base transceiver stations (AP), and one specific base transceiver station is set as a root station. Here, total of the path cost of a certain base transceiver station, a root station, and the base transceiver station on the communication path of a between is called root run cost. A root station transmits periodically the configuration message (Configuration Message) which set the MAC (Media Access Control) address of a local station as the transmitting agency address. This configuration message has the root run field, and a root station sets the root run cost field as "0", and transmits.

[0004] The base transceiver station immediately after starting receives the fixed period and configuration message defined beforehand, out of two or more configuration messages which received, chooses a configuration message with the smallest root run cost, and sets up a channel to the transmitting agency base transceiver station of the selected configuration message.

[0005] Moreover, the path cost of a local station is added to the root run cost of the selected configuration message, the MAC Address of a transmitting agency address local station is set up, and a configuration message is transmitted. By the above, a configuration message is spread to all base transceiver stations, and a base transceiver station connects a communication path in the shape of a tree with a root station as the starting point.

[0006] According to this approach, it is prevented that the packet transfer to all base transceiver stations is enabled, and a transfer packet carries out the loop formation of between base transceiver stations when a base transceiver station carries out the packet transfer of the communication-path (tree-like transfer path) top connected in the shape of a tree.

[0007] Next, as a conventional technique 2 of the packet transfer approach, there is the transfer approach using a source routing protocol as indicated by reference "ISO/IEC 8802-5, "Information technology-Local and metropolitan networks-Part 5:Token ringaccess method and physical layer specifications", 1992."

[0008] According to this approach, a wireless terminal (STA) carries out blow cast transmission of the retrieval frame which contains the MAC Address of a destination terminal first, when transmitting a data packet. The destination terminal which received the retrieval frame carries out broadcasting transmission of all the path planning frames that gave the MAC Address of a transmit terminal. The base transceiver station which received all path planning frames writes in the identifier of a local station, and transmits it to other base transceiver stations.

[0009] A transmit terminal copies the permutation of the identifier of the wireless terminal written in all the path planning frames that chose two or more received path planning frames of all, and were chosen as the header unit of a data packet as routing information, and transmits. If a data packet is received, a base transceiver station will choose the base transceiver station

used as the next destination based on the routing information directed to the header unit of a packet, will transmit a data packet, and will transmit even a destination wireless terminal.

[0010] Next, the grasp approach of the location of the base transceiver station on the transfer path of the shape of a tree using a source routing protocol is considered. By this approach, the base transceiver station newly connected to the tree-like transfer path carries out broadcasting transmission of the retrieval frame. Each base transceiver station which received the retrieval frame carries out broadcasting transmission of all the path planning frames. The base transceiver station newly connected to the tree-like transfer path grasps the location on the transfer path of the shape of a tree of other base transceiver stations from all the received path planning frames.

[0011] On the other hand, other base transceiver stations which received the retrieval frame carry out broadcasting transmission of the retrieval frame containing the MAC Address of the transmitting agency base transceiver station of the retrieval frame concerned, i.e., the base transceiver station newly connected to the tree-like transfer path. The base transceiver station newly connected to the tree-like transfer path transmits all path planning frames to each retrieval frame transmitting former base transceiver station. By the above, other base transceiver stations grasp the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the following effectiveness can be acquired as explained above. Namely, the monitor of the packet transmitted in the direction approaching a local station in a tree-like path [transfer] top is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and it registers with a table. Since the destination is chosen with reference to a table, the shortcut of the transfer path of the shape of said tree is carried out and it was made to transmit when a packet was received A packet can be transmitted without passing through a redundant transfer path, and the effectiveness of preventing the increment in transfer delay time amount and the fall of a throughput is acquired.

[0120] Moreover, since it was made not to choose as the destination the base transceiver station located in the direction (the direction of a high order of a tree-like transfer path) same in view of a local station as a root station when the packet transmitted by carrying out the shortcut of the tree-like transfer path from other base transceiver stations was transmitted, it can prevent that a transfer packet carries out a loop formation, and the effectiveness of preventing multiple-times reception of the same packet and the fall of a throughput is acquired. And without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames, shortcut transmission is attained and the effectiveness that the increment in a control load of a throughput fall and a wireless terminal can be prevented is acquired.

[0121] Moreover, the 1st number of base transceiver stations taken to relay a packet from the base transceiver station which the sending-station address of a packet shows to a local station, Since the 2nd number of base transceiver stations taken to relay a packet from the base transceiver station which matched with the transmitting agency wireless terminal and was registered into the table to a local station is compared and the table was updated It becomes possible to increase more the amount of redundancy reduction of the transfer path by shortcut transmission, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented more effectively is acquired.

[0122] Moreover, in said each base transceiver station, since the base transceiver station which the sending-station address of a packet shows updated the table according to the location on a tree-like transfer path, the effectiveness that it can prevent that a base transceiver station continues carrying out shortcut transmission based on the information before a wireless terminal moves is acquired.

[0123] Moreover, since registration of the wireless terminal concerned registered into said table was deleted when the period which was able to define beforehand the wireless terminal under registration on said table after registering a wireless terminal into a table after renewal of registration passed When a wireless terminal ends a communication link, after it becomes possible to delete registration of a table after progress of the period defined beforehand and a wireless terminal moves in a base transceiver station, it becomes possible to delete unnecessary information. Therefore, the effectiveness it is ineffective to it being possible to control the amount of memory which a table takes is acquired.

[0124] Moreover, the notice response packet of connection which shows the location of the notice packet of connection which shows the transfer sequence of a base transceiver station,

and a local station defines, the location on the transfer path of the shape of a tree of a transmitting agency base transceiver station grasps from the notice packet of connection, and since it made transmit to the base transceiver station input and adjoin the address of a local station to the notice response packet of connection, in order for other base transceiver stations not to transmit a path-planning frame, the effectiveness that the fall of a throughput can prevent is acquired.

[0125] Moreover, the notice packet of a path which shows the mutual physical relationship between the base transceiver stations on the transfer path of the shape of the connection addition packet which shows the newly connected address of a base transceiver station, and a tree is defined. Since the base transceiver station newly connected to the tree-like transfer path transmits a connection addition packet and the base transceiver station which received the connection addition packet transmitted the notice packet of a path to the transmitting agency base transceiver station of the connection addition packet concerned Transmission of the notice response packet of connection of other base transceiver stations cannot be required, but consumption of a wireless resource can be controlled further, and the effectiveness that the fall of a throughput can be prevented more effectively can be acquired. And the effectiveness that time amount until it grasps the physical relationship on a tree-like transfer path can be shortened more can be acquired.

[0126] Moreover, since the address of an adjoining base transceiver station is inputted into the notice packet of cutting and it was made to transmit to all base transceiver stations when the notice packet of cutting was defined and cutting of a channel with an adjoining base transceiver station was detected, each base transceiver station becomes possible [grasping the base transceiver station cut from the tree-like transfer path], and the effectiveness that the shortcut transmission to this base transceiver station can be stopped is acquired.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in order to build a transfer path in the shape of a tree with a root station as the starting point according to the packet transfer approach concerning the above-mentioned conventional technique 1, For example, although a base transceiver station AP 4 and a base transceiver station AP 3 are able to carry out direct communication when it is constituted in the shape of a tree, as a transfer path shows drawing 8 The packet transfer to a base transceiver station AP 3 is performed by the path "AP4-AP1-AP2-AP3" from a base transceiver station AP 4. For this reason, a transfer path becomes redundant and the problem of the fall of the throughput by the increment in transfer delay time amount and consumption of a wireless resource arises.

[0013] Moreover, in drawing 8, if the packet transfer to a base transceiver station AP 3 is performed from a base transceiver station AP 4, the loop formation of the transfer packet is carried out in a path "AP4-AP3-AP2-AP1-AP4", multiple-times reception of the same packet will be carried out, or the problem of the fall of the throughput by consumption of a wireless resource will arise.

[0014] Moreover, when according to the packet transfer approach concerning the above-mentioned conventional technique 2 it is constituted in the shape of a tree as a transfer path shows drawing 8 since a data packet is transmitted according to routing information for example, the packet transfer to AP3 from a base transceiver station AP 4 is directly transmitted according to a path "AP4-AP3", and does not produce the situation in which a transfer packet carries out a loop formation, either. However, all the wireless terminals that transmit a packet carry out broadcasting transmission of the retrieval frame, in order to acquire the routing information according to individual for every destination wireless terminal, and a destination wireless terminal needs to carry out broadcasting transmission by return [frames / all / path planning], and, generally they have the problem that the effect of the throughput fall by broadcasting transmission of a retrieval frame and all path planning frames becomes large in a wireless network with little transmission capacity, compared with a cable network. Moreover, since a wireless terminal needs to manage routing information for every destination wireless terminal, it also produces the problem that the load of a wireless terminal becomes large.

[0015] Moreover, when applying the packet transfer approach concerning the conventional technique 2 to grasp of the location on the transfer path of the shape of a tree of a base transceiver station, the base transceiver station which all base transceiver stations transmitted the retrieval frame, and was newly connected to the tree-like transfer path has the problem that where of the fall of the throughput by consumption of a wireless resource arises, in order to carry out broadcasting transmission of all the path planning frames to all other base transceiver stations.

[0016] This invention was made in view of the above-mentioned situation, it can transmit a packet, without passing through a redundant transfer path, and aims at offering the base transceiver station using the wireless packet transfer approach and this approach of preventing the fall of a throughput.

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MEANS

[Means for Solving the Problem] In order to carry out solution achievement of the above-mentioned technical problem, this invention has the following configurations. Namely, the wireless packet transfer approach concerning claim 1 Are the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and it sets to said each base transceiver station. The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0018] As opposed to a base transceiver station choosing only the base transceiver station which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention A base transceiver station carries out the monitor of the packet transmitted in the direction of a local station, and a transmitting agency wireless terminal and a sending-station base transceiver station are matched and registered into a table. When a destination wireless terminal is registering with a table, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path, and carry out shortcut transmission of the packet differ.

[0019] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0020] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning

frames by the wireless terminal.

[0021] The base transceiver station which carried out the monitor of the packet transmitted in the direction of a local station in this invention It is judged as the base transceiver station subordinate whom the sending-station address shows a transmitting agency wireless terminal, or the base transceiver station subordinate located in a local station and an opposite direction seen from the base transceiver station which the sending-station address shows. It registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0022] Moreover, a base transceiver station carries out shortcut transmission, only when a packet is received from a root station and the base transceiver station located in an opposite direction on a tree-like transfer path, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of this shortcut packet Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same on a tree-like transfer path in view of a local station as a root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0023] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames in advance of packet transmission, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0024] In said each base transceiver station, the wireless packet transfer approach concerning claim 2 carries out the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree, and is characterized by matching the base transceiver station which the wireless terminal which the transmitting agency address of said packet shows, and the sending-station address show, and registering with said table.

[0025] In this invention, it adds to a base transceiver station carrying out the monitor of the packet of the direction of a local station. Carry out the monitor of the packet transmitted by shortcut, and it is judged as the base transceiver station subordinate whom the sending-station address shows a transmitting agency wireless terminal, or the base transceiver station subordinate located in a local station and an opposite direction seen from the base transceiver station which the sending-station address shows. It registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table By carrying out shortcut transmission to the base transceiver station matched, the effectiveness that it can prevent that the transfer path of a packet grows into redundancy, and the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0026] The wireless packet transfer approach concerning claim 3 is set to said each base transceiver station. It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree from other base transceiver stations is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, The 1st number of base transceiver stations taken to relay a packet from the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows to a local station according to the transfer path of the shape of said tree, The 2nd number of base transceiver stations taken to relay a packet from the base transceiver station which matched with said transmitting agency wireless terminal, and was registered into said table to a local station according to the transfer path of the shape of said tree is compared. It is characterized by matching with said transmitting agency wireless terminal the base transceiver station which the sending-station address of the packet concerned shows

on condition that the 1st number of base transceiver stations is more than the 2nd number of base transceiver stations, and carrying out renewal of registration of said table.

[0027] In this invention, it becomes possible [the base transceiver station which carried out the monitor of the packet] to increase more the amount of redundancy reduction of the transfer path by shortcut transmission by matching with the wireless terminal of transmitting [the larger base transceiver station of tree path distance] origin, and registering with a shortcut table, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0028] The wireless packet transfer approach concerning claim 4 is set to said each base transceiver station. It is the case where the monitor of the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree when the monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree from other base transceiver stations is carried out is carried out. When the transmitting agency wireless terminal of the packet concerned is registered into said table, On the transfer path of the shape of said tree, the base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows matches with said transmitting agency wireless terminal, and is not located between the base transceiver station under registration on said table, and a local station, Or it is contingent [the base transceiver station which said sending-station address shows / on matching with said transmitting agency wireless terminal, and being in agreement with the base transceiver station under registration on said table]. The base transceiver station which the sending-station address of the packet concerned by which the monitor was carried out shows is matched with said transmitting agency wireless terminal, and it is characterized by carrying out renewal of registration at said table.

[0029] In this invention, the base transceiver station which carried out the monitor of the packet When the base transceiver station which the sending-station address shows matches with a transmitting agency wireless terminal and is not located between the base transceiver station under registration on a table, and a local station on a tree-like transfer path The effectiveness of preventing a base transceiver station continuing carrying out shortcut transmission based on the information before wireless terminal migration is acquired by judging it as what the wireless terminal moved to the subordinate of another base transceiver station, and carrying out renewal of registration of the table.

[0030] Moreover, the larger base transceiver station of tree path distance can be matched with a transmitting agency wireless terminal, it can register with a table, the amount of redundancy reduction of the transfer path by shortcut transmission is increased more, and the effectiveness that the increment in transfer delay time amount and the fall of a throughput can be prevented is acquired.

[0031] The wireless packet transfer approach concerning claim 5 is the wireless packet transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and is set to said each base transceiver station. The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. Match the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not

choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0032] As opposed to a base transceiver station choosing only the base transceiver station which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. When a destination wireless terminal and a sending-station base transceiver station are matched and registered into a table and a destination wireless terminal is registering with a table, on a tree-like transfer path, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin, and carry out shortcut transmission of the packet differ.

[0033] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0034] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal.

[0035] The base transceiver station which carried out the monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits in this invention A transmitting agency wireless terminal judges it as the wireless base subordinate whom the sending-station address shows, and it registers with a table. At the time of a packet transfer when a destination wireless terminal is registered on a table By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0036] Moreover, a base transceiver station carries out shortcut transmission, only when a packet is received from a tree-like transfer path top root station and the base transceiver station located in an opposite direction, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of this shortcut packet Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same in view of a local station as a tree-like transfer path top root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0037] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without a wireless terminal carrying out broadcasting transmission of a retrieval frame or all path planning frames in advance of packet transmission, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0038] The wireless packet transfer approach concerning claim 6 is the packet wireless transfer approach in a wireless packet communication network including the wireless terminal which belongs to two or more base transceiver stations which constitute a tree-like transfer path by making a specific base transceiver station into a root station, and each base transceiver station, and is set to said each base transceiver station. Carry out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, match the base transceiver station which the wireless terminal which the destination address of the packet concerned shows, and the sending-station address show, and it registers with a table. When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree

located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0039] As opposed to a base transceiver station choosing only the base transceiver station which adjoins on a tree-like transfer path as a destination [degree] base transceiver station with the above-mentioned conventional technique 1, and transmitting a packet in this invention A base transceiver station carries out the monitor of the packet which other base transceiver stations transmit to the subordinate's wireless terminal. When a destination wireless terminal and a sending-station base transceiver station are matched and registered into a table and a destination wireless terminal is registering with a table, on a tree-like transfer path, the points which choose as a destination [degree] base transceiver station the base transceiver station which does not adjoin, and carry out shortcut transmission of the packet differ.

[0040] As opposed to the approach of choosing as a destination [degree] base transceiver station the base transceiver station which does not adjoin on a tree-like transfer path simply, and carrying out a packet transfer moreover, this invention Shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction is carried out on a tree-like transfer path, in view of a local station subordinate's wireless terminal or local station. It differs in that the receiving base transceiver station of a shortcut packet is not transmitted to the base transceiver station located in the direction of a root station on a tree-like transfer path, in view of a local station.

[0041] Moreover, it differs to the conventional technique 2 needing the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal in that this invention does not need the broadcasting transmission of a retrieval frame and all path planning frames by the wireless terminal.

[0042] The base transceiver station where other base transceiver stations carried out the monitor of the packet which transmits to a wireless terminal in this invention A destination wireless terminal judges it as the wireless base subordinate whom the sending-station address shows, and registers with a shortcut table. At the time of a packet transfer, when a destination wireless terminal is registered on a shortcut table By carrying out shortcut transmission to the base transceiver station matched, prevention of the transfer path of a packet becoming redundancy is attained, and it becomes possible [preventing the increment in transfer delay time amount, and the fall of a throughput].

[0043] Moreover, a base transceiver station carries out shortcut transmission only of the time of the packet reception from a root station and the base transceiver station located in an opposite direction on a tree-like transfer path, in view of the wireless terminal or local station under attribution. The receiving base transceiver station of a shortcut packet Prevention of a transfer packet carrying out the loop formation of transmitting to the base transceiver station located in the direction same on a tree-like transfer path in view of a local station as a root station by forbidding is attained, and it becomes possible [preventing multiple-times reception of the same packet, and the fall of a throughput].

[0044] Moreover, by carrying out the monitor of the packet which other base transceiver stations transmit, the shortcut transmission of a base transceiver station is attained without carrying out broadcasting transmission of a retrieval frame or all path planning frames, and prevention of the fall of a throughput and the increment in the control load of a wireless terminal accompanying broadcasting transmission of the retrieval frame between wireless terminals or all path planning frames of it is attained.

[0045] The wireless packet transfer approach concerning claim 7 is set to said each base

transceiver station. The notice packet of connection and the notice response packet of connection are defined. Said notice packet of connection and said notice response packet of connection In the base transceiver station which it had path information field in the data division, and said path information field showed the transfer sequence of said all base transceiver stations of having transmitted the packet concerned, and was newly connected to the tree-like transfer path In said adjoining base transceiver station which transmitted said notice packet of connection to the base transceiver station which adjoins on a tree-like transfer path, and received said notice packet of connection Grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice packet of connection concerned from said path information field, and a tree-like transfer path is updated. Moreover, input the transmitting agency address of the notice packet of connection concerned into the destination address of the notice response packet of connection, and said notice response packet of connection is transmitted. The address of a local station is transmitted to all the base transceiver stations that adjoin said path information field of the notice packet of connection concerned on the transfer path of the shape of a tree except the base transceiver station which carries out an additional input, and which the sending-station address of said notice packet of connection shows. Set to the base transceiver station which received said notice response packet of connection, grasp the location on the transfer path of the shape of a tree of the transmitting agency base transceiver station of the notice response packet of connection concerned from said path information field, and a tree-like transfer path is updated. When the destination address of the notice response packet of connection concerned is not in agreement with the address of a local station, it is characterized by carrying out an additional input and transmitting the address of a local station to the path information field of the notice response packet of connection concerned.

[0046] This invention transmits the notice packet of connection which has the path information field where the base transceiver station which newly connected to a tree-like transfer path shows the hysteresis of the base transceiver station to which the packet transmitted, and other base transceiver stations on the transfer path of the shape of a tree which received this notice packet of connection differ from the conventional technique from said path information field in the point of grasping the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path.

[0047] In order that according to this invention other base transceiver stations can grasp the location on the transfer path of the shape of a tree of the base transceiver station newly connected to the tree-like transfer path and other base transceiver stations may not transmit a path planning frame by the notice packet of connection, the effectiveness of shortening time amount until it grasps the effectiveness and physical relationship which prevent the fall of a throughput is acquired.

[0048] The wireless packet transfer approach concerning claim 8 is set to said each base transceiver station. A connection addition packet and the notice packet of a path are defined as the packet which transmits between said base transceiver stations. Said connection addition packet Have the connection base transceiver station field in the data division, and said connection base transceiver station field shows the address of the base transceiver station which the transmitting agency base transceiver station of the connection addition packet concerned newly connected. Said notice packet of a path has the path information table field in the data division. Said path information table field In the base transceiver station which showed the mutual physical relationship between the base transceiver stations on the transfer path of the shape of a tree which the transmitting agency base transceiver station of the packet concerned grasps, and was newly connected to the tree-like transfer path In the base transceiver station which received said connection addition packet made into transmitting [the base transceiver station which transmits said connection addition packet to addressing to a base transceiver station which connected the channel, and adjoins on a tree-like transfer path] origin Said notice packet of a path is transmitted to the transmitting agency base transceiver station of the connection addition packet concerned. Moreover, the connection addition packet concerned is transmitted to the base transceiver station which adjoins on a tree-like transfer

path except the base transceiver station which the sending-station address of the notice packet of connection concerned shows. In the base transceiver station which received said connection addition packet which makes it a transmitting agency except the base transceiver station which adjoins on a tree-like transfer path The transmitting agency base transceiver station of said notice packet of connection grasps having connected the base transceiver station which the connection base transceiver station field of said connection addition packet shows, and the channel, and updates a tree-like transfer path. Moreover, transmit said connection addition packet to all the base transceiver stations that adjoin on the transfer path of the shape of a tree except the base transceiver station which the sending-station address of said connection addition packet shows, and it sets to the base transceiver station which received said notice packet of a path. It is characterized by grasping the location on the transfer path of the shape of a tree of other base transceiver stations from said path information table field, and updating a tree-like transfer path.

[0049] This invention transmits the connection addition packet in which the newly connected base transceiver station includes the connection base transceiver station field which shows the MAC Address of a connection place base transceiver station to a connection place base transceiver station to a tree-like transfer path. Other base transceiver stations on the transfer path of the shape of a tree which received this connection addition packet It grasps that the transmitting agency base transceiver station, i.e., the base transceiver station newly connected to the tree-like transfer path, connected with the base transceiver station which said connection base transceiver station field shows. The base transceiver station newly connected to the transfer path of the shape of said tree in which the notice packet of a path was received differs from the conventional technique in the point of grasping the location on the transfer path of the shape of a tree of said other base transceiver stations, from said path information field.

[0050] According to this invention, the effectiveness shorten more time amount in order for the base transceiver station newly connected to the tree-like transfer path to be able to grasp the location of the base transceiver station of ** on a tree-like transfer path and not to require transmission of the notice response packet of connection of other base transceiver stations, until it grasps the effectiveness and the physical relationship which controls consumption of a wireless resource further and prevents the fall of a throughput more by the notice packet of a path is acquired.

[0051] The wireless packet transfer approach concerning claim 9 defines the notice packet of cutting as the packet which transmits between said base transceiver stations in said each base transceiver station. Said notice packet of cutting Have the cutting base transceiver station field in data division, and it sets to said each base transceiver station. When it has the function to detect cutting of a channel with the base transceiver station which adjoins on a tree-like transfer path and cutting of a channel with said adjoining base transceiver station is detected, In the base transceiver station which inputted the address of said adjoining base transceiver station into said cutting base transceiver station field, transmitted said notice packet of cutting to all the base transceiver stations on a tree-like transfer path, and received said notice packet of cutting It is characterized by grasping what the channel between the base transceiver station which said cutting base transceiver station field shows, and the transmitting agency base transceiver station of said notice packet of cutting cut, and updating a tree-like transfer path.

[0052] According to this invention, it is effective in becoming possible to grasp the base transceiver station cut from the tree-like transfer path, being matched with the base transceiver station concerned by the notice packet of cutting, and being able to suspend shortcut transmission to the wireless terminal under registration on a table by it.

[0053] The wireless packet transfer approach concerning claim 10 is characterized by carrying out the shortcut of the tree-like transfer path, and not transmitting about the packet transmitted by broadcasting, in said each base transceiver station. According to this invention, the effectiveness that it is prevented that the packet transmitted by broadcasting carries out a loop formation, and it prevents multiple-times reception of the same packet and the fall of a throughput is acquired by not carrying out shortcut transmission of the broadcasting packet.

[0054] In said each base transceiver station, the wireless packet transfer approach concerning

claim 11 is characterized by deleting registration of the wireless terminal concerned registered into said table, when the period which was able to define beforehand the wireless terminal under registration on said table after registering a wireless terminal into said table after renewal of registration passes. According to this invention, when a wireless terminal ends a communication link, registration of a table can be deleted in the period defined beforehand, and the effectiveness which controls the amount of memory which a table takes is acquired.

[0055] The base transceiver station concerning claim 12 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the sending-station address show, The monitor of the packet transmitted in the direction approaching a local station in the transfer path top of the shape of said tree is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the sending-station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. Carry out the shortcut of the transfer path of the shape of said tree to the base transceiver station chosen as said destination, and a packet is transmitted. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0056] The base transceiver station concerning claim 13 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the transmitting agency address of a packet shows, and the receiving station address show, The monitor of the packet which the wireless terminal under attribution in other base transceiver stations transmits is carried out. The monitor section which matches the base transceiver station which the wireless terminal which the transmitting agency address of the packet concerned shows, and the receiving station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0057] The base transceiver station concerning claim 14 is a base transceiver station in the wireless packet communication network which constitutes a tree-like transfer path by making a specific base transceiver station into a root station. The table for matching and registering the base transceiver station which the wireless terminal which the destination address of a packet

shows, and the sending-station address show, The monitor section which carries out the monitor of the packet transmitted to a wireless terminal from other base transceiver stations, matches the base transceiver station which the wireless terminal which the destination address of the packet concerned shows, and the sending-station address show, and is registered into said table, With reference to said table, it has the transfer section which transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station. Said transfer section When a packet is received from said root station and the base transceiver station on the transfer path of the shape of said tree located in an opposite direction, in view of the wireless terminal or local station under attribution in a local station, The base transceiver station matched with said destination wireless terminal the condition [the destination wireless terminal shown with the destination address of the packet concerned being registered into said table] is chosen as the destination. A packet is transmitted to the base transceiver station which carried out the shortcut of the transfer path of the shape of said tree, and was chosen as said destination. When the packet transmitted from other base transceiver stations by carrying out the shortcut of the transfer path of the shape of said tree is received, it is characterized by not choosing as the destination the base transceiver station on the transfer path of the shape of said tree located in the same direction as said root station, in view of a local station.

[0058]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained, referring to a drawing. Drawing 1 is the outline block diagram showing the description section of a base transceiver station AP used with the wireless packet communication network concerning the gestalt of this operation. It has the description for the base transceiver station AP shown in this drawing to be arranged at each node of a wireless packet communication network in which the transfer path was formed in the shape of a tree for example, by the spanning tree protocol, carry out the shortcut of the tree-like transfer path, and transmit a packet.

[0059] In addition, about other functions, it is the same as that of the usual base transceiver station. For example, when a packet is received from other base transceiver stations, or when a packet is received from the wireless terminal under attribution, while a packet is transmitted to this terminal while the destination wireless terminal of said packet is belonging to a local station and a destination wireless terminal is not belonging to a local station, a packet is transmitted to the base transceiver station which is the next destination.

[0060] In drawing 1, the packet monitor section 1 (monitor section) carries out the monitor of the packet transmitted in the direction which approaches a local station in a tree-like path [transfer] top, and registers into the shortcut table 2 (table) the wireless terminal and base transceiver station which transmit the packet concerned. The base transceiver station which the wireless terminal which the transmitting agency address of the packet (namely, packet transmitted in the direction which approaches in the direction of a local station) by which the monitor was carried out shows, and the sending-station address show is matched mutually, and is registered into the shortcut table 2.

[0061] The packet transfer section 3 (transfer section) transmits the packet from the wireless terminal or other base transceiver stations under attribution in a local station, and has the function to carry out the shortcut of the transfer path (tree-like transfer path) of normal, and to transmit a packet, by referring to the shortcut table 2. In addition, each base transceiver station and each wireless terminal have the address (MAC Address) of an equipment proper as an identifier.

[0062] A format of the packet transmitted to drawing 2 with the wireless packet communication network concerning the gestalt of this operation is shown. As shown in this drawing, each packet consists of data divisions which input the header unit which inputs a control signal, and transfer data. Packet A is used for the transfer packet from a wireless terminal to a base transceiver station, and has the header unit which consists of "format classification", the "receiving station address", the "transmitting agency address", a "destination address", and "reservation."

[0063] Moreover, Packet B is used for the packet transfer between base transceiver stations, and has the header unit which serves as "format classification" from four kinds of address fields,

the "receiving station address", the "sending-station address", a "destination address", and the "transmitting agency address." Packet C is used for the transfer packet from a base transceiver station to a wireless terminal, and has the header unit which consists of "format classification", a "destination address", the "sending-station address", the "transmitting agency address", and "reservation."

[0064] Here, a destination address shows the MAC Address of the wireless terminal of the destination of a packet, the transmitting agency address shows the MAC Address of the transmitting agency wireless terminal of a packet, the receiving station address shows the MAC Address of the base transceiver station of the destination (base transceiver station which receives a packet from a current base transceiver station), and the sending-station address shows the MAC Address of the base transceiver station of the source (base transceiver station which transmits a packet to a current base transceiver station).

[0065] Moreover, the below-mentioned notice packet of connection and the packet for the notice response of connection which are used when a base transceiver station is newly connected to a wireless packet communication network have path information field, respectively, and the MAC Address of a base transceiver station which relayed the packet concerned to the head is inputted into this path information field in order of junction in the MAC Address of a transmitting agency base transceiver station.

[0066] Next, about basic actuation of the base transceiver station concerning the gestalt of this operation, the wireless packet communication network which makes the transfer path of the shape of a tree shown in below-mentioned drawing 7 and below-mentioned drawing 8 is made into an example, and is explained along with the flow chart shown in drawing 3 - drawing 6. Here, in drawing 7, although the transfer path is not set up between base transceiver stations AP3 and AP7, base transceiver stations AP3 and AP4, and base transceiver stations AP3 and AP6, there is no shelter of an electric wave among each other, and a mutual transmitting packet makes a monitor possible.

[0067] Moreover, the number of the base transceiver stations for junction required when the shape of a tree carries out the transfer path top packet transfer of between two wireless bases is defined as the "tree path distance" between base transceiver stations. For example, in drawing 8, base transceiver stations AP3 and AP7 and the tree path distance of a between are 3, and base transceiver stations AP3 and AP4 and the tree path distance of a between are 2. Moreover, seen from a certain base transceiver station, the direction of a root station on a tree-like transfer path is made into the direction of a high order, and an opposite direction is made into the direction of low order.

[0068] Hereafter, basic actuation of each base transceiver station is explained. In addition, in the following basic actuation, about the actuation which carries out the monitor of the packet, and is registered and updated at the shortcut table 2, it is mainly carried out by the packet monitor section 1, and is mainly carried out by the packet transfer section 3 about the actuation which determines the destination with reference to the shortcut table 2. Moreover, various kinds of other control / judgment actuation is realized by functions other than packet monitor section 1 and packet transfer section 3. However, it is not necessary to necessarily assign as a function of the packet monitor section 1 or the packet transfer section 3, and you may realize on software as a function of a base transceiver station about these functions (basic actuation).

[0069] (Basic actuation 1) Each base transceiver station receives the packet which a surrounding base transceiver station transmits, and carries out the monitor of the packet B (step S01). When the monitor of the packet B is carried out here (step S02: YES), the base transceiver station where the base transceiver station (sending station AP) which the sending-station address of this packet shows adjoins on a tree-like transfer path -- not but (step S03: NO) And this packet B is a packet (the direction packet of a local station) transmitted in the direction of a local station (step S04: YES). If the wireless terminal of a transmitting agency has not been registered (step S05: NO), the base transceiver station of a transmitting agency will be matched with the sending station AP of the packet concerned, it will register with the shortcut table 2 (claim 1, 12 reference), and a registration hold timer will be started (step S06). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path (step

S03: YES), it does not register.

[0070] (Basic actuation 2) It is judged that each base transceiver station is the case where the base transceiver station (receiving station AP) which the sending station AP and the receiving station address of Packet B show does not adjoin on a tree-like transfer path, and it is the packet (shortcut packet) by which shortcut transmission was carried out when it is not the packet of the direction of a local station (step S04: NO) (step S07: YES).

[0071] If the wireless terminal (the transmitting agency STA) of a transmitting agency has not been registered at this time (step S05: NO), the transmitting agency STA will be matched with a sending station AP, and it will register with the shortcut table 2 (claim 2 reference). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path, it does not register. Moreover, a registration hold timer is started at the time of shortcut table registration.

[0072] (Basic actuation 3) When the transmitting agency STA is registering each base transceiver station into the shortcut table 2 (step S05: YES), The tree path distance between a local station and a sending station AP (the 1st number of base transceiver stations) When it is beyond the tree path distance between the base transceiver stations matched with the wireless terminal under a local station and registration (the 2nd number of base transceiver stations) (step S08: YES), renewal of registration is carried out, using the base transceiver station matched as a sending station AP (claim 3 reference). (step S09) A registration hold timer is restarted at the time of renewal of registration.

[0073] (Basic actuation 4) When each base transceiver station is not located on the transfer path of the shape of a tree between the base transceiver stations and local stations by which the sending station AP is matched with the wireless terminal under registration on the shortcut table 2, Or when in agreement with the base transceiver station matched with the wireless terminal under registration (under registration STA) (step S08: YES), renewal of registration of the base transceiver station matched is carried out in a sending station AP (claim 4 reference). (step S09) A registration hold timer is restarted at the time of renewal of registration. In addition, the above-mentioned basic actuation 3 and the above-mentioned basic actuation 4 are not performed to coincidence, but either is chosen beforehand.

[0074] (Basic actuation 5) Each base transceiver station carries out the monitor of the packet C which surrounding AP transmits (step S01:NO- step S10:YES), and registers the wireless terminal (destination STA) and sending station AP of the destination into the shortcut table 2 (claim (steps S11-S13) 6, 14 reference). However, when a sending station AP is an adjoining base transceiver station on a tree-like transfer path (step S11: YES), it does not register. When Destination STA is registered (step S12: YES), renewal of registration of the shortcut table 2 is carried out (step S14), and a registration hold timer is restarted.

[0075] (Basic actuation 6) Each base transceiver station carries out the monitor of the packet A which a surrounding wireless terminal transmits (step S01:NO- step S10:NO), and registers a receiving station AP into the shortcut table 2 the transmitting agency STA (claim (steps S20-S23) 5, 13 reference). However, when a receiving station AP is an adjoining base transceiver station on a tree-like transfer path (step S21: YES), it does not register. When the transmitting agency STA is registered (step S22: YES), renewal of registration of the shortcut table 2 is carried out (step S24), and a registration hold timer is restarted.

[0076] (Basic actuation 7) Each base transceiver station transmits Packet B one by one by making into a receiving station AP all the base transceiver stations that adjoin on the transfer path of the shape of a tree except the sending station AP of a receive packet while carrying out broadcasting transmission to (step S31:YES) and the wireless terminal under attribution when a receiving station AP is a local station (step S30: YES), and a receive packet is a broadcasting packet (step S32). However, the transfer by shortcut is not performed in this case (claim 10 reference). It prevents that the packet transmitted by broadcasting carries out the loop formation of the path top by this.

(Basic actuation 8) Each base transceiver station transmits Packet A to (step S33:YES) and Destination STA, when Destination STA is a wireless terminal under attribution in a local station subordinate (common to all (step S34) claims).

[0077] (Basic actuation 9) When each base transceiver station receives Packet A from the wireless terminal under attribution (step S35: YES), Or when Packet B is received from the base transceiver station (low order AP) of the direction of low order (step S36: YES), When Destination STA is registering with the shortcut table 2, shortcut transmission of the packet B is carried out in this base transceiver station by making (step S37: YES) and the base transceiver station matched into a receiving station AP (step S38). In not registering, Packet B is transmitted to all the base transceiver stations that adjoin on the transfer path of (step S37: NO) and the shape of a tree except a sending station AP one by one (common to all (step S39) claims).

[0078] (Basic actuation 10) Each base transceiver station transmits Packet B to the base transceiver station (low order AP) of (step S40: YES) and the direction of low order, when a shortcut packet is received (common to all (step S41) claims). Since a packet is not transmitted to a high order AP at this time, generating of a loop formation is prevented.

(Basic actuation 11) When a receive packet is not a shortcut packet when Packet B is received from the base transceiver station (high order AP) of the direction of a high order namely, (step S40: NO), Packet B is transmitted to all the base transceiver stations that adjoin on the transfer path of the shape of a tree except a sending station AP one by one (step S42). Since the shortcut transfer of the receive packet from a high order AP is not carried out at this time, generating of a loop formation is prevented.

[0079] (Basic actuation 12) Each base transceiver station has the registration hold corresponding to each wireless terminal under registration on the shortcut table 2 by 1 to 1, and measures the continuation sheep time of delivery of the packet for updating registration of each wireless terminal. When the time amount defined beforehand passes not carrying out renewal of registration of the wireless terminal concerned after each base transceiver station measures continuation sheep time of delivery with a registration hold timer and a certain wireless terminal is registered and a registration hold timer becomes a time-out (step S50), registration of the wireless terminal (corresponding STA) is deleted from the shortcut table 2 (claim (step S51) 11 reference).

[0080] Moreover, each base transceiver station performs the following basic actuation in order to connect / cut a channel to the wireless packet communication network which consists of a tree-like transfer path.

(Basic actuation 13) Each base transceiver station defines the notice packet of connection, and the notice response packet of connection. When it newly connects with a tree-like transfer path, input the transfer sequence of a base transceiver station into the notice packet of connection, and other base transceiver stations are told about the location of the local station on a tree-like transfer path. Moreover, when the notice packet of connection is received, the transmitting agency address of the notice packet of connection concerned is inputted into the destination address of the notice response packet of connection, and other base transceiver stations are told about the location of a local station (claim 7 reference).

[0081] (Basic actuation 14) When each base transceiver station defined the notice packet of a path which shows the mutual physical relationship between the connection addition packet which shows the newly connected address of a base transceiver station, and a base transceiver station, transmits a connection addition packet to addressing to a base transceiver station which connected the channel, and transmits it to each of other base transceiver station and a path addition packet receives, the notice packet of a path transmits to the transmitting agency base transceiver station of a connection addition packet, and the location of a local station tells about (claim 8 reference).

[0082] (Basic actuation 15) Each base transceiver station has the function to detect cutting of a channel with the base transceiver station which adjoins on a tree-like transfer path. The notice packet of cutting which shows that the channel was cut is defined as the packet which transmits between base transceiver stations. When this notice packet of cutting is transmitted to all the base transceiver stations on a tree-like transfer path and the notice packet of cutting is received, what the channel between the base transceiver stations which this packet shows cut is grasped (claim 9 reference).

[0083] Next, actuation of each base transceiver station is explained to be the example of a configuration of the wireless packet communication network by the base transceiver station which has above-mentioned basic actuation. The example of arrangement of the base transceiver station which starts the gestalt of this operation at drawing 7 is shown. In this drawing, the wireless terminal STA 3 shall belong to a base transceiver station AP 3, the wireless terminal STA 5 belongs to a base transceiver station AP 5, the wireless terminal STA 1 shall belong to a base transceiver station AP 1, and the wireless terminal STA 7 shall belong [the wireless terminal STA 6 shall belong to a base transceiver station AP 6, and] to the base transceiver station AP 7. Moreover, let the graphic form part to which the slash was given be the field where the shelter of an electric wave shall be expressed and the transfer path between base transceiver stations is not set up in this drawing.

[0084] Generally, in wireless LAN, such as a wireless packet communication network, each base transceiver station (AP) transmits periodically the beacon signal which gave the MAC Address of a local station into a self-cel. Each wireless terminal (STA) transmits an imputed signal to the transmitting agency AP of a beacon signal. The base transceiver station which received this makes the transmitting agency STA of an imputed signal under attribution, and performs transmission of the packet to the wireless terminal under this attribution, and reception/transfer of the packet from this wireless terminal. Each base transceiver station may notify the completion of imputed to a wireless terminal for the improvement in dependability.

[0085] When it constitutes a wireless packet communication network, each base transceiver station sets up a tree-like transfer path with a spanning tree protocol by making a specific base transceiver station into a root station. However, in drawing 7, a root office is made into a base transceiver station AP 1, and all the path costs of each base transceiver station are taken as the same value. Then, each base transceiver station grasps the location on the transfer path of the shape of a tree of other base transceiver stations, and builds the information about a transfer path.

[0086] Here, in drawing 7, the case where a base transceiver station AP 7 is newly connected to a tree-like transfer path is made into an example, and the case where the above-mentioned basic actuation 13 (claim 7 reference) is used as the construction approach of the information about a transfer path is explained. In this case, a base transceiver station AP 7 transmits the notice packet of connection for notifying having connected with the base transceiver station AP 4 to a base transceiver station AP 4. The base transceiver station AP 4 which received this carries out the additional input of the MAC Address of a local station in the path information field of the notice packet of connection, and transmits it to the base transceiver stations AP1 and AP6 which adjoin this notice packet of connection while it transmits the notice response packet of connection for notifying having received the notice packet of connection to a base transceiver station AP 7.

[0087] It is transmitted like the following, the notice packet of connection transmitted from the base transceiver station AP 7 is transmitted to all base transceiver stations, and each base transceiver station which received this transmits the notice response packet of connection to a base transceiver station AP 7. Each MAC Address of base transceiver stations AP7, AP4, AP1, AP2, and AP3 is inputted into the path information field of this result, for example, the notice packet of connection which a base transceiver station AP 5 receives, in order. Moreover, the newly connected base transceiver station AP 7 gets to know the location on the transfer path of the shape of a tree of each base transceiver station by the notice response packet of connection from other base transceiver stations. Moreover, other base transceiver stations get to know the location of a base transceiver station AP 7 by the notice packet of connection. The transfer path of the shape of a final tree set up by each base transceiver station which uses a spanning tree protocol for drawing 8, and is shown in drawing 7 is shown.

[0088] Next, in drawing 7, the case where the above-mentioned basic actuation 14 is used as other construction approaches (claim 8 reference) of the information about a transfer path when a base transceiver station AP 7 is newly connected to a tree-like transfer path (base transceiver station 4) is explained. According to this approach, a base transceiver station AP 7 transmits the connection addition packet showing additional connection having been made to a

base transceiver station AP 4 to a base transceiver station AP 4. The base transceiver station AP 4 which received this transmits the connection addition packet concerned to the adjoining base transceiver stations AP1 and AP6, and transmits the notice packet of a path to a base transceiver station AP 7.

[0089] The connection addition packet transmitted from the base transceiver station AP 7 is transmitted to all base transceiver stations, and other base transceiver stations which received the connection addition packet grasp that the base transceiver station AP 7 connected the channel between base transceiver stations AP 4. A base transceiver station AP 7 gets to know the location on the transfer path of the shape of a tree of other base transceiver stations from the path information table field of the notice packet of a path. This path information table field is expressed as a list of MAC Addresses of each base transceiver station on the basis of the transmitting agency base transceiver station of for example, a path information table packet. for example, the path information table field which a base transceiver station AP 4 transmits -- ***** (AP (AP4, AP6)4, AP1, AP2, AP3, AP5) -- it is expressed.

[0090] Hereafter, the actuation in the case of carrying out the shortcut of the transfer path in the wireless packet communication network (tree-like transfer path) shown in drawing 8 , and transmitting a packet is explained as actuation of the base transceiver station concerning the gestalt of this operation. The shortcut of the tree-like transfer path is carried out to drawing 9 by making the communication link between the wireless terminals STA7 and STA3 into an example, and the transmitting example 1 which carries out packet transmission is shown. However, in an initial state, one shall not be registered into the shortcut table 2 of all base transceiver stations for the wireless terminal.

[0091] First, the case where the wireless terminal STA 7 transmits a packet to the wireless terminal STA 3 is explained. If the packet addressed to wireless terminal STA3 is transmitted from the wireless terminal STA 7, the base transceiver station AP 7 where the wireless terminal STA 7 belongs will transmit a packet to the base transceiver station AP 4 which the destination wireless terminal STA 3 is not belonging Packet A from the wireless terminal STA 7 at the time of reception, and adjoins in a tree-like transfer path since un-***** [the wireless terminal STA 3 / the shortcut table 2]. A base transceiver station AP 3 carries out the monitor of the packet B which a base transceiver station AP 7 transmits, since the direction of transfer of the packet transmitted to AP1 from a base transceiver station AP 7 is the direction of a local station, registers into the shortcut table 2 the base transceiver station AP 7 which is the wireless terminal STA 7 and sending station of a transmitting agency, and starts a registration hold timer.

[0092] A base transceiver station AP 4 transmits a packet to the base transceiver stations AP1 and AP6 which the wireless terminal STA 3 is not belonging, and adjoin in a tree-like transfer path since un-***** [a shortcut table]. Although the packet which a base transceiver station AP 3 carries out the monitor of the packet which a base transceiver station AP 4 transmits, and is transmitted to AP1 from a base transceiver station AP 4 is the direction of a local station, since the wireless terminal STA 7 of a transmitting agency is shortcut table registering and the base transceiver station AP 4 which is a sending station is located between the base transceiver station AP 7 under tree-like registration on a transfer path, and a local station, registration of a shortcut table is not updated.

[0093] The packet from a base transceiver station AP 4 is transmitted to a base transceiver station AP 3 via base transceiver stations AP1 and AP2, and a base transceiver station AP 3 transmits Packet C to the wireless terminal STA 3. A base transceiver station AP 3 carries out the monitor of the packet C which transmits to the wireless terminal STA 3, a base transceiver station AP 7, and AP4 and AP6 match the base transceiver station AP 3 which are the destination wireless terminal STA 3 and a sending station, they register it into the shortcut table 2, and they start a registration hold timer. By the above, the packet transmitted from the wireless terminal STA 7 is received by the wireless terminal STA 3.

[0094] Then, the case where the wireless terminal STA 3 transmits a packet to the wireless terminal STA 7 after this is explained. In this case, since a base transceiver station AP 3 is the packet which the wireless terminal STA 7 was registering with the shortcut table, and received from the wireless terminal under attribution, it carries out the shortcut of the transfer path (AP

in this case 3-AP2-AP1-AP4-AP7) of the shape of an original tree, and transmits it to a base transceiver station AP 7 directly.

[0095] Since a base transceiver station AP 7 is in agreement with the base transceiver station AP 3 whose base transceiver station where the wireless terminal STA 3 of the transmitting origin of the packet (shortcut packet) transmitted by shortcut is shortcut table registering, and is matched is a sending station, it restarts a registration hold timer and transmits Packet C to the wireless terminal STA 7. By the above, the packet transmitted from the wireless terminal STA 3 is received by the wireless terminal STA 7. The contents of each final shortcut table 2 of the base transceiver stations AP3, AP4, AP6, and AP7 in the above-mentioned transmitting example 1 are shown in drawing 10.

[0096] The shortcut of the tree-like transfer path is carried out to drawing 11 by making the communication link between the wireless terminal STA 6 and the wireless terminal STA 3 into an example, and the transmitting example 2 which carries out packet transmission is shown.

However, in an initial state, the contents of each shortcut table 2 of base transceiver stations AP3, AP4, AP6, and AP7 shall be shown in above-mentioned drawing 10, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal. Moreover, a base transceiver station AP 3 makes possible the monitor of the packet which the wireless terminal STA 6 transmits.

[0097] If Packet A is transmitted to a base transceiver station AP 6 from the wireless terminal STA 6, a base transceiver station AP 3 will carry out the monitor of this packet A, will register into the shortcut table 2 the base transceiver station AP 6 which is the wireless terminal STA 6 and receiving station of a transmitting agency, and will start a registration hold timer. Since the base transceiver station AP 6 which received the packet is the packet which the destination terminal STA 3 of Packet A was registering with the shortcut table 2, and received from the base transceiver station under attribution, it carries out shortcut transmission of the packet B to the base transceiver station AP 3 matched.

[0098] Since the base transceiver station of the base transceiver station AP 3 which received this packet where the wireless terminal STA 6 of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched corresponds with the base transceiver station AP 6 of a transmitting agency, it restarts a registration hold timer and transmits Packet C to the wireless terminal STA 3. Since base transceiver stations AP4 and AP6 are in agreement with the base transceiver station AP 3 whose base transceiver station where the destination wireless terminal STA 3 of Packet C is registering with the shortcut table 2, and is matched is a sending station, they restart a registration hold timer. By the above, the packet transmitted from the wireless terminal STA 6 is received by the wireless terminal STA 3.

[0099] Then, the case where the wireless terminal STA 3 transmits a packet to the wireless terminal STA 6 after this is explained. In this case, since a base transceiver station AP 3 is the packet which the wireless terminal STA 6 was registering with the shortcut table 2, and received from the wireless terminal under attribution, it carries out shortcut transmission to a base transceiver station AP 6. Since a base transceiver station AP 6, and AP4 and AP7 are in agreement with the base transceiver station AP 3 whose base transceiver station where the wireless terminal STA 3 of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched is a sending station, a registration hold timer is restarted and a base transceiver station AP 6 transmits Packet C to the wireless terminal STA 7. By the above, the packet transmitted from the wireless terminal STA 3 is received by the wireless terminal STA 6. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in the above-mentioned transmitting example 2 are shown in drawing 12.

[0100] The shortcut of the tree-like transfer path is carried out to drawing 13 by making the communication link between the wireless terminal STA 5 and the wireless terminal STA 6 into an example, and the transmitting example 3 which carries out packet transmission is shown.

However, in an initial state, the contents of each shortcut table 2 of base transceiver stations AP3, AP4, AP7, and AP6 shall be shown in above-mentioned drawing 12, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal.

[0101] if Packet A is transmitted to the wireless terminal STA 6 from the wireless terminal STA

5, the base transceiver station AP 5 which received this will transmit Packet B to all the base transceiver stations (here -- a base transceiver station AP 3) where the destination terminal STA 6 of Packet A adjoins in a tree-like transfer path not under attribution (it is un-registering to an imputed table) but since un-**** [the shortcut table 2] moreover.

[0102] Since it receives from the base transceiver station where the packet B which received is located in an opposite direction to a root office and the wireless terminal STA 6 of the destination is registering a base transceiver station AP 3 into the shortcut table 2, it carries out shortcut transmission to the base transceiver station AP 6 matched. If a shortcut packet is received, a base transceiver station AP 6 will register into the shortcut table 2 the base transceiver station AP 3 which is the wireless terminal STA 5 and sending station of a transmitting agency, and will start a registration hold timer.

[0103] Moreover, base transceiver stations AP4 and AP7 carry out the monitor of the shortcut packet which a base transceiver station AP 6 transmits, register into the shortcut table 2 the base transceiver station AP 3 which is the wireless terminal STA 6 and sending station of a transmitting agency, and start a registration hold timer. Next, a base transceiver station AP 6 transmits the packet C which received to the wireless terminal STA 6. Since a base transceiver station AP 3 is in agreement with the base transceiver station AP 6 whose base transceiver station which the monitor of this packet C is carried out, and the destination wireless terminal STA 6 is registering with the shortcut table 2, and is matched is a sending station, it restarts a registration hold timer.

[0104] Then, the case where the wireless terminal STA 6 transmits a packet to the wireless terminal STA 5 after this is explained. In this case, since a base transceiver station AP 3 is in agreement with the base transceiver station AP 6 whose base transceiver station which the monitor of the packet A transmitted from the wireless terminal STA 6 is carried out, and the wireless terminal STA 6 of a transmitting agency is registering with the shortcut table 2, and is matched is a sending station, it restarts a registration hold timer.

[0105] Since a base transceiver station AP 6 is the packet which the wireless terminal STA 5 was registering with the shortcut table 2, and received from the wireless terminal under attribution, it carries out shortcut transmission to the base transceiver station AP 3 matched. Since the base transceiver station AP 3 which received this is in agreement with the base transceiver station AP 6 whose base transceiver station where the base transceiver station AP 6 which is the wireless terminal STA 6 and sending station of the transmitting origin of a shortcut packet is registering with the shortcut table 2, and is matched is a sending station, it starts a registration hold timer.

[0106] Next, it is not and the wireless terminal STA 5 of the destination is not belonging, and since un-**** [a base transceiver station AP 3 / the shortcut table 2], it transmits Packet B to the base transceiver station AP 5 which are a tree-like transfer path top root station and a contiguity station of an opposite direction. This prevents that a transfer packet carries out the loop formation of the path "AP3 →AP2 →AP1 →AP4 →AP3." However, a path "AP4 →AP3" is a path by shortcut transmission.

[0107] Although the monitor of the packet B transmitted from a base transceiver station AP 3 is carried out, since it is not the direction of a local station, a base transceiver station AP 4, and no AP6 and AP7 are carried out. The base transceiver station AP 5 which received the packet transmits Packet C to the wireless terminal STA 5. By the above, the packet transmitted from the wireless terminal STA 6 is received by the wireless terminal STA 5. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in the above-mentioned transmitting example 3 are shown in drawing 14.

[0108] Next, the transmitting example which transmits a packet without carrying out the shortcut of the tree-like transfer path to drawing 15 by making the communication link between the wireless terminal STA 1 and the wireless terminal STA 3 into an example is shown. However, in an initial state, the contents of each shortcut table of base transceiver stations AP3, AP4, AP7, and AP6 shall be shown in above-mentioned drawing 14, and one shall not be registered into the shortcut table of the other base transceiver station for the wireless terminal.

[0109] If the packet A addressed to wireless terminal STA3 is transmitted from the wireless

terminal STA 1, the base transceiver station AP 1 which received this will transmit a packet to the base transceiver stations AP2 and AP4 which it is not and the wireless terminal STA 3 of the destination is not belonging, and adjoin on a tree-like transfer path since un-**** [the shortcut table 2]. The base transceiver station AP 2 which received this is transmitted to a base transceiver station AP 3, and transmits a base transceiver station AP 3 to the wireless terminal STA 3.

[0110] On the other hand, although the wireless terminal STA 3 is registering [be / it] into the shortcut table 2 the base transceiver station AP 4 which received the packet from the base transceiver station AP 1, in order that the packet B which received may receive from the base transceiver station of the direction of a high order, the transfer by shortcut is not performed to a base transceiver station AP 3. It is prevented that it is received by the wireless terminal STA 3 and only one side of the packet transmitted towards base transceiver stations AP2 and AP4 from the base transceiver station AP 1 receives the packet with the same wireless terminal STA 3 twice by this.

[0111] Next, an example of operation (renewal of registration of a shortcut table) when the wireless terminal STA 7 which belonged to drawing 16 in the base transceiver station AP 7 moves to the subordinate of a base transceiver station AP 6 is shown. The wireless terminal STA 7 transmits a packet via a base transceiver station AP 6. Since the monitor of the packet A which the wireless terminal STA 7 transmits is carried out, and the wireless terminal STA 7 is registering with a shortcut table and the base transceiver station AP 6 which is a receiving station is not located between the tree-like transfer path top base transceiver station AP 7 (under registration), and a local station, a base transceiver station AP 4 changes matching into a base transceiver station AP 6, and starts a registration hold timer.

[0112] When a base transceiver station AP 4 cannot carry out the monitor of the packet A transmitted from the wireless terminal STA 7, the monitor of the packet B transmitted from a base transceiver station AP 6 is carried out, and matching of a shortcut table is changed similarly. The contents of each final shortcut table of the base transceiver stations AP3, AP4, AP7, and AP6 in this example are shown in drawing 17 .

[0113] Next, the example in which the wireless terminal STA 7 which moved to the subordinate of a base transceiver station AP 6 transmits a packet to drawing 18 with a broadcasting method is shown. When transmitting a packet by broadcasting, transmission by carrying out the shortcut of the transfer path is not performed, but the transfer path top of the shape of a tree which is an original transfer path is transmitted to a packet. That is, in this example, a base transceiver station AP 6 will transmit this to the adjoining base transceiver station AP 4, if a packet is received from the wireless terminal STA 7.

[0114] The base transceiver station AP 4 which received this is transmitted to the adjoining base transceiver stations AP1 and AP7. A base transceiver station AP 1 transmits the packet transmitted from the base transceiver station AP 4 to a base transceiver station AP 2, a base transceiver station AP 2 transmits this to a base transceiver station AP 3, and a base transceiver station AP 3 transmits this to a base transceiver station AP 5. The packet transmitted from the wireless terminal STA 7 is transmitted to all base transceiver stations by the above.

[0115] Finally, the actuation at the time of cutting a tree-like transfer path is described. Each base transceiver station is judged to be that from which the channel with the base transceiver station which emits the beacon signal concerned was cut, when the base transceiver station which adjoins on the transfer path of the shape for example, of a tree supervises the beacon signal transmitted periodically and cannot carry out N time (N: threshold defined beforehand) reception of this beacon signal continuously.

[0116] For example, in above-mentioned drawing 7 , when the blocker occurs among base transceiver stations AP4 and AP7 and a base transceiver station AP 4 cannot receive the beacon signal from a base transceiver station AP 7, a base transceiver station AP 4 is judged to be what the channel with a base transceiver station AP 7 cut, and the notice packet of cutting as which the MAC Address of a base transceiver station AP 7 was inputted into the "cutting base transceiver station field" is transmitted to base transceiver stations AP6 and AP1.

[0117] The base transceiver station AP 1 which received this is transmitted to a base transceiver station AP 2, and the notice packet of cutting is transmitted to all base transceiver stations like the following. When what the channel with base transceiver stations AP7 and AP4 cut each base transceiver station which received the notice packet of cutting for is got to know and the wireless terminal under registration on a shortcut table is matched with the base transceiver station AP 7, the registration is deleted and transmission by shortcut is suspended.

[0118] As mentioned above, although 1 operation gestalt of this invention was explained, this invention is not restricted to this operation gestalt, and even if the design change of the range which does not deviate from the summary of this invention etc. occurs, it is included in this invention. For example, although each base transceiver station shall have the shortcut table 2, this shortcut table is good also as what only two or more specific base transceiver stations have, and only two or more base transceiver stations of these specification may constitute it from a gestalt of above-mentioned operation as what can make shortcut transmission.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 2] It is drawing showing a format of the packet concerning the gestalt of implementation of this invention.

[Drawing 3] It is a flow chart for explaining the basic actuation 1-4 of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 4] It is a flow chart for explaining the basic actuation 5 and 6 of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 5] It is a flow chart for explaining the basic actuation 7-11 of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 6] It is a flow chart for explaining the basic actuation 12 of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 7] It is drawing for explaining the example of arrangement of the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 8] It is drawing showing an example of the wireless packet communication network (tree-like transfer path) constituted by the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 9] It is drawing for explaining the packet transmitting example 1 by the base transceiver station concerning the gestalt of implementation of this invention.

[Drawing 10] It is drawing for explaining an example of the shortcut table created in the packet transmitting example 1 concerning the gestalt of implementation of this invention.

[Drawing 11] It is drawing for explaining the packet transmitting example 2 concerning the gestalt of implementation of this invention.

[Drawing 12] It is drawing for explaining an example of the shortcut table created in the packet transmitting example 2 concerning the gestalt of implementation of this invention.

[Drawing 13] It is drawing for explaining the packet transmitting example 3 concerning the gestalt of implementation of this invention.

[Drawing 14] It is drawing for explaining an example of the shortcut table created in the packet transmitting example 3 concerning the gestalt of implementation of this invention.

[Drawing 15] It is drawing for explaining the packet transmitting example concerning the gestalt of implementation of this invention (when not carrying out shortcut transmission).

[Drawing 16] It is drawing for explaining the packet transmitting example concerning the gestalt of implementation of this invention (when a wireless terminal moving).

[Drawing 17] It is drawing for explaining an example of the shortcut table created in the packet transmitting example concerning the gestalt of implementation of this invention (when a wireless terminal moves).

[Drawing 18] It is drawing for explaining the packet transmitting example concerning the gestalt of implementation of this invention (when carrying out broadcasting transmission).

[Description of Notations]

AP, AP1-AP7 [-- A shortcut table, 3 / -- The packet transfer section, S01-S14, S20-S24,

S30-S42, S50, S51 / -- Step.] -- A base transceiver station, STA, STA1, STA3-STA7 -- A wireless terminal, 1 -- The packet monitor section, 2

[Translation done.]

(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2000-78147

(P2000-78147A)

(43)公開日 平成12年3月14日(2000.3.14)

(51)IntCl. ⁷	識別記号	F I	テマコード(参考)
H 0 4 L 12/28		H 0 4 L 11/00	3 1 0 B
H 0 4 B 7/26		H 0 4 B 7/26	M
H 0 4 Q 7/38			1 0 9 M
H 0 4 L 12/56		H 0 4 L 11/20	1 0 2 D

審査請求 有 請求項の数14 O L (全 23 頁)

(21)出願番号 特願平10-244158
(22)出願日 平成10年8月28日(1998.8.28)

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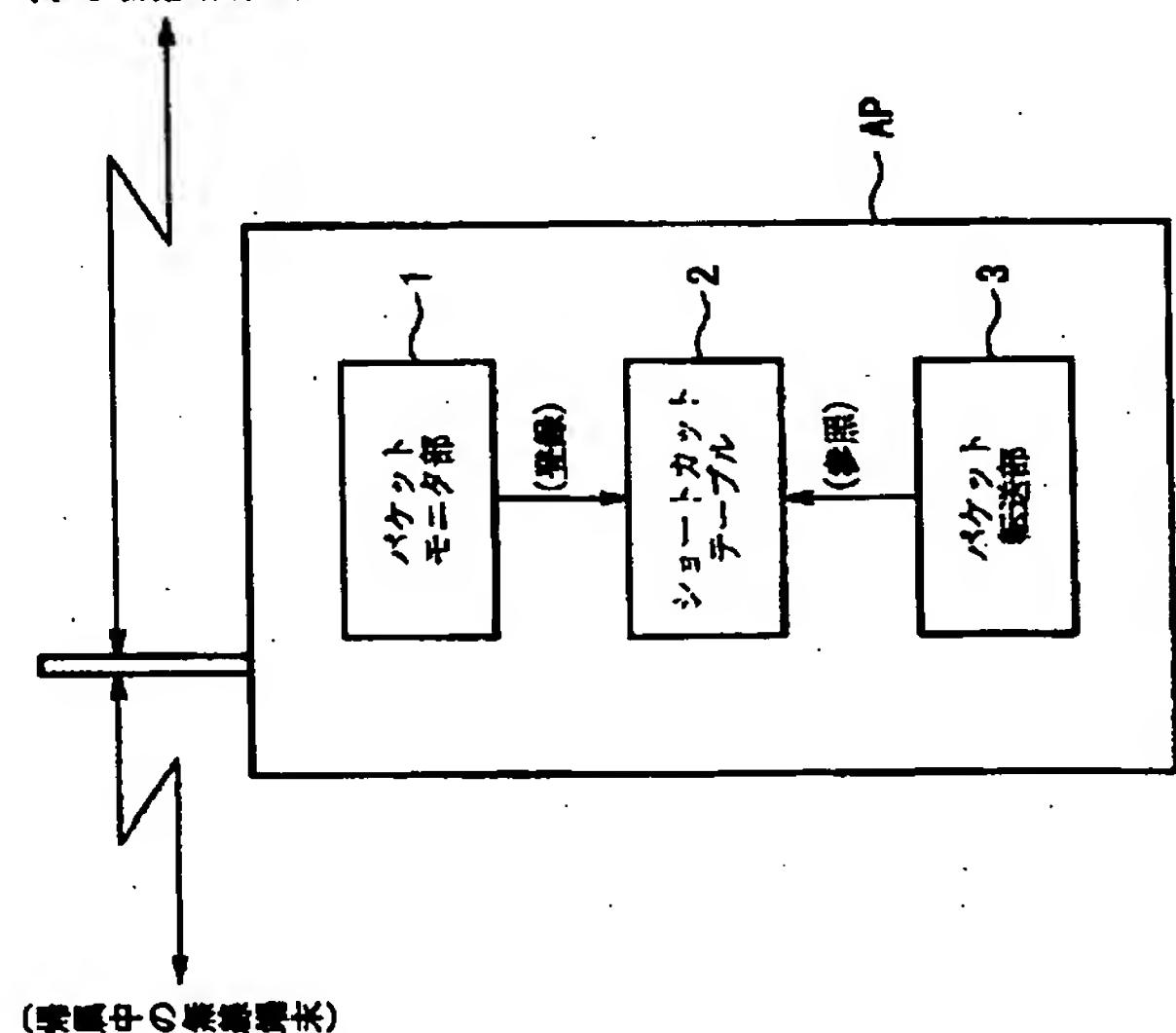
(54)【発明の名称】 無線パケット転送方法および該方法を用いた無線基地局

(57)【要約】

【課題】 冗長な転送経路を経ることなくパケットの転送を行うことができ、スループットの低下を防止する無線パケット転送方法および該方法を用いた無線基地局を提供すること。

【解決手段】 各無線基地局では、パケットモニタ部1により、ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけてテーブル2に登録する。パケット転送部3により、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、前記テーブル2を参照して宛先無線端末に対応づけられた無線基地局を次の転送先として選択する。

(送信機と受信機)



【特許請求の範囲】

【請求項1】 特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線ネットワークにおける無線ネットワーク転送方法であって、

前記各無線基地局において、

前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、

他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線ネットワーク転送方法。

【請求項2】 前記各無線基地局において、

他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタして、前記パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録することを特徴とする請求項1に記載された無線ネットワーク転送方法。

【請求項3】 前記各無線基地局において、

他無線基地局から前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタした場合または他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタした場合であって、当該パケットの送信元無線端末が前記テーブルに登録されている場合、

モニタされた当該パケットの送信局アドレスが示す無線基地局から前記ツリー状の転送経路に従い自局までパケットを中継するのに要する第1の無線基地局数と、前記送信元無線端末と対応づけて前記テーブルに登録された無線基地局から前記ツリー状の転送経路に従い自局までパケットを中継するのに要する第2の無線基地局数とを比較し、第1の無線基地局数が第2の無線基地局数以上であることを条件に当該パケットの送信局アドレスが示す無線基地局を前記送信元無線端末と対応づけて前記テーブルに登録更新することを特徴とする請求項1または2のいずれかに記載された無線ネットワーク転送方法。

【請求項4】 前記各無線基地局において、

他無線基地局から前記ツリー状の転送経路上を自局に近

づく方向に転送されるパケットをモニタした場合または他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタした場合であって、当該パケットの送信元無線端末が前記テーブルに登録されている場合、

モニタされた当該パケットの送信局アドレスが示す無線基地局が、前記ツリー状の転送経路上において前記送信元無線端末と対応づけて前記テーブルに登録中の無線基地局と自局との間に位置しないこと、または前記送信局アドレスが示す無線基地局が、前記送信元無線端末と対応づけて前記テーブルに登録中の無線基地局に一致することを条件として、モニタされた当該パケットの送信局アドレスが示す無線基地局を前記送信元無線端末と対応づけて前記テーブルに登録更新することを特徴とする請求項1または2のいずれかに記載された無線ネットワーク転送方法。

【請求項5】 特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線ネットワークにおける無線ネットワーク転送方法であって、

前記各無線基地局において、

他無線基地局に帰属中の無線端末が送信するパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、

他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線ネットワーク転送方法。

【請求項6】 特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線ネットワークにおける無線ネットワーク転送方法であって、

前記各無線基地局において、

他無線基地局から無線端末に送信されるパケットをモニタして、当該パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの

宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線パケット転送方法。

【請求項7】 前記各無線基地局において、接続通知パケットと接続通知応答パケットを定義し、前記接続通知パケットと前記接続通知応答パケットは、そのデータ部に経路情報フィールドを持ち、前記経路情報フィールドは当該パケットを転送した全ての前記無線基地局の転送順番を示し、

新たにツリー状の転送経路に接続した無線基地局において、ツリー状の転送経路上隣接する無線基地局へ前記接続通知パケットを送信し、

前記接続通知パケットを受信した前記隣接する無線基地局において、前記経路情報フィールドから当該接続通知パケットの送信元無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新し、また当該接続通知パケットの送信元アドレスを接続通知応答パケットの宛先アドレスに入力して前記接続通知応答パケットを送信し、自局のアドレスを当該接続通知パケットの前記経路情報フィールドに追加入力して前記接続通知パケットの送信局アドレスが示す無線基地局を除くツリー状の転送経路上隣接する全ての無線基地局へ転送し、

前記接続通知応答パケットを受信した無線基地局において、前記経路情報フィールドから当該接続通知応答パケットの送信元無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新し、当該接続通知応答パケットの宛先アドレスが自局のアドレスに一致しない場合、自局のアドレスを当該接続通知応答パケットの経路情報フィールドに追加入力して転送することを特徴とする請求項1ないし6の何れかに記載された無線パケット転送方法。

【請求項8】 前記各無線基地局において、前記無線基地局間を転送するパケットに、接続追加パケットと経路通知パケットを定義し、前記接続追加パケットは、そのデータ部に接続無線基地局フィールドを持ち、前記接続無線基地局フィールドは当該接続追加パケットの送信元無線基地局が新たに接続した無線基地局のアドレスを示し、前記経路通知パケットは、そのデータ部に経路情報テーブルフィールドを持ち、前記経路情報テーブルフィールドは、当該パケットの送信元無線基地局が把握しているツリー状の転送経路上における無線基地局間の相互の位置関係を示し、

新たにツリー状の転送経路に接続した無線基地局において、通信路を接続した無線基地局宛に前記接続追加パケットを送信し、

ツリー状の転送経路上隣接する無線基地局を送信元とする前記接続追加パケットを受信した無線基地局において、当該接続追加パケットの送信元無線基地局へ前記経路通知パケットを送信し、また当該接続追加パケットを当該接続通知パケットの送信局アドレスが示す無線基地局以外でツリー状の転送経路上隣接する無線基地局へ転送し、

ツリー状の転送経路上隣接する無線基地局以外を送信元とする前記接続追加パケットを受信した無線基地局において、前記接続通知パケットの送信元無線基地局が前記接続追加パケットの接続無線基地局フィールドの示す無線基地局と通信路を接続したことを把握してツリー状の転送経路を更新し、また前記接続追加パケットの送信局アドレスが示す無線基地局を除くツリー状の転送経路上隣接する全ての無線基地局へ前記接続追加パケットを転送し、

前記経路通知パケットを受信した無線基地局において、前記経路情報テーブルフィールドから他の無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新することを特徴とする請求項1ないし6の何れかに記載された無線パケット転送方法。

【請求項9】 前記各無線基地局において、前記無線基地局間を転送するパケットに、切断通知パケットを定義し、前記切断通知パケットは、データ部に切断無線基地局フィールドを持ち、

また、前記各無線基地局において、ツリー状の転送経路上隣接する無線基地局との通信路の切断を検出する機能を有し、前記隣接する無線基地局との通信路の切断を検出したとき、前記隣接する無線基地局のアドレスを前記切断無線基地局フィールドに入力して、前記切断通知パケットをツリー状の転送経路上の全ての無線基地局へ送信し、

前記切断通知パケットを受信した無線基地局において、前記切断無線基地局フィールドの示す無線基地局と前記切断通知パケットの送信元無線基地局との間の通信路が切断したことを把握してツリー状の転送経路を更新することを特徴とする請求項7または8のいずれかに記載された無線パケット転送方法。

【請求項10】 前記各無線基地局において、ブロードキャストにより送信されるパケットについて、ツリー状の転送経路をショートカットして送信しないことを特徴とする請求項1ないし9のいずれかに記載された無線パケット転送方法。

【請求項11】 前記各無線基地局において、無線端末を前記テーブルに登録後、または前記テーブルに登録中の無線端末を登録更新後、あらかじめ定められた期間が経過したとき、前記テーブルに登録された当該無線端末

の登録を削除することを特徴とする請求項1ないし9のいずれかに記載された無線パケット転送方法。

【請求項12】 特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、

前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、

前記転送部は、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記転送先として選択された無線基地局に対し前記ツリー状の転送経路をショートカットしてパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線基地局。

【請求項13】 特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、

他無線基地局に帰属中の無線端末が送信するパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、

前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、

前記転送部は、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先とし

て選択された無線基地局にパケットを送信し、

他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線基地局。

【請求項14】 特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、

パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、

他無線基地局から無線端末に送信されるパケットをモニタして、当該パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、

前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、

前記転送部は、

自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、

他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする無線基地局。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 この発明は、無線パケット通信網における無線パケット転送方法および該方法を用いた無線基地局に関する。

【0002】

【従来の技術】 パケット転送方法の従来技術1として、文献「ISO/IEC 10038, ANSI/IEEE Std802.1D, "Information technology - Telecommunications and information exchange between systems - Local area networks - Media access control (MAC) bridges", 1993」に開示されているように、スパニング・ツリー・プロトコルを利用した転送方法がある。

【0003】 この方法によれば、あらかじめ全ての無線基地局（AP）にパスコスト（Pathcost）を設定し、特定の1つの無線基地局をルート局に設定する。ここで、或る無線基地局とルート局と間の通信経路上にある無線

基地局のパスコストの総和をルートパスコストと呼ぶ。ルート局は、送信元アドレスに自局のMAC(Media Access Control)アドレスを設定したコンフィギュレーション・メッセージ(Configuration Message)を周期的に送信する。このコンフィギュレーション・メッセージはルートパスフィールドを持ち、ルート局はルートパスコストフィールドを「0」に設定して送信する。

【0004】起動直後の無線基地局は、あらかじめ定められた一定期間、コンフィギュレーション・メッセージを受信し、受信した複数のコンフィギュレーション・メッセージの中から最もルートパスコストの小さいコンフィギュレーション・メッセージを選択し、選択したコンフィギュレーション・メッセージの送信元無線基地局に対して通信路を設定する。

【0005】また、選択したコンフィギュレーション・メッセージのルートパスコストに自局のパスコストを加算し、送信元アドレス自局のMACアドレスを設定して、コンフィギュレーション・メッセージを送信する。以上により、コンフィギュレーション・メッセージは全無線基地局へ伝搬し、無線基地局はルート局を起点にツリー状に通信経路を接続する。

【0006】この方法によれば、無線基地局はツリー状に接続した通信経路(ツリー状の転送経路)上をパケット転送することにより、全無線基地局へのパケット転送が可能とされ、また転送パケットが無線基地局間をループすることが防止される。

【0007】次に、パケット転送方法の従来技術2として、文献「ISO/IEC 8802-5, "Information technology - Local and metropolitan networks - Part 5: Token ring access method and physical layer specifications", 1992」に開示されているように、ソース・ルーティング・プロトコルを利用した転送方法がある。

【0008】この方法によれば、無線端末(STA)は、データパケットを送信する時、まず宛先端末のMACアドレスを含む探索フレームをブロードキャスト送信する。探索フレームを受信した宛先端末は、送信端末のMACアドレスを付与した全経路探索フレームをブロードキャスト送信する。全経路探索フレームを受信した無線基地局は自局の識別子を書き込み、他の無線基地局へ転送する。

【0009】送信端末は受信した複数の全経路探索フレームを選択し、データパケットのヘッダ部にルーティング情報として、選択した全経路探索フレームに書き込まれた無線端末の識別子の順列をコピーして送信する。無線基地局はデータパケットを受信すると、パケットのヘッダ部に指示されたルーティング情報に基づき、次の転送先となる無線基地局を選択してデータパケットを転送し、宛先無線端末まで転送する。

【0010】次に、ソース・ルーティング・プロトコルを利用したツリー状の転送経路上における無線基地局の

位置の把握方法について考える。この方法では、新たにツリー状の転送経路に接続した無線基地局は、探索フレームをブロードキャスト送信する。探索フレームを受信した各無線基地局は、全経路探索フレームをブロードキャスト送信する。新たにツリー状の転送経路に接続した無線基地局は、受信した全経路探索フレームから他の無線基地局のツリー状の転送経路上における位置を把握する。

【0011】一方、探索フレームを受信した他の無線基地局は、当該探索フレームの送信元無線基地局、すなわち新たにツリー状の転送経路に接続した無線基地局のMACアドレスを含む探索フレームをブロードキャスト送信する。新たにツリー状の転送経路に接続した無線基地局は、全経路探索フレームを各検索フレーム送信元無線基地局に送信する。以上により、他の無線基地局は、新たにツリー状の転送経路に接続した無線基地局のツリー状の転送経路上における位置を把握する。

【0012】

【発明が解決しようとする課題】ところで、上述の従来技術1にかかるパケット転送方法によれば、ルート局を起点としてツリー状に転送経路を構築するため、例えば転送経路が図8に示すようにツリー状に構成された場合、無線基地局AP4と無線基地局AP3が直接通信することが可能であるにもかかわらず、無線基地局AP4から無線基地局AP3へのパケット転送は、経路「AP4-AP1-AP2-AP3」により行われる。このため、転送経路が冗長となり、転送遅延時間の増加、無線資源の消費によるスループットの低下という問題が生じる。

【0013】また、図8において、無線基地局AP4から無線基地局AP3へのパケット転送を行うと、転送パケットが経路「AP4-AP3-AP2-AP1-AP4」においてループされ、同一パケットが複数回受信されたり、無線資源の消費によるスループットの低下という問題が生じる。

【0014】また、上述の従来技術2にかかるパケット転送方法によれば、データパケットはルーティング情報に応じて転送されるため、例えば転送経路が図8に示すようにツリー状に構成された場合、無線基地局AP4からAP3へのパケット転送は経路「AP4-AP3」により直接的に転送され、転送パケットがループする事態も生じない。しかしながら、パケットを送信する全無線端末は、各宛先無線端末毎に個別のルーティング情報を得るために探索フレームをブロードキャスト送信し、宛先無線端末は全経路探索フレームを折り返しブロードキャスト送信する必要がある、一般に有線ネットワークに比べて伝送容量の少ない無線ネットワークでは探索フレームと全経路探索フレームのブロードキャスト送信によるスループット低下の影響が大きくなるという問題がある。また、無線端末は、宛先無線端末毎にルーティング

情報を管理する必要があるため、無線端末の負荷が大きくなるという問題も生じる。

【0015】また、従来技術2にかかるパケット転送方法を、無線基地局のツリー状の転送経路上における位置の把握に適用する場合、全無線基地局が探索フレームを送信し、また新たにツリー状の転送経路に接続した無線基地局は、他の全ての無線基地局への全経路探索フレームをブロードキャスト送信するため、無線資源の消費によるスループットの低下が生じるという問題がある。

【0016】この発明は、上記事情に鑑みてなされたもので、冗長な転送経路を経ることなくパケットの転送を行うことができ、スループットの低下を防止することのできる無線パケット転送方法および該方法を用いた無線基地局を提供することを目的とする。

【0017】

【課題を解決するための手段】上記課題を解決達成するため、この発明は以下の構成を有する。すなわち、請求項1にかかる無線パケット転送方法は、特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線パケット通信網における無線パケット転送方法であって、前記各無線基地局において、前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする。

【0018】前述の従来技術1では、無線基地局はツリー状の転送経路上で隣接する無線基地局のみを次転送先無線基地局として選択してパケットを転送するのに対し、この発明では、無線基地局が自局方向に転送されるパケットをモニタして、テーブルに送信元無線端末と送信局無線基地局とを対応づけて登録し、宛先無線端末がテーブルに登録中の場合にはツリー状の転送経路上で隣接していない無線基地局を次転送先無線基地局に選択してパケットをショートカット送信する点異なる。

【0019】また、単純にツリー状の転送経路上で隣接していない無線基地局を次転送先無線基地局に選択してパケット転送する方法に対して、この発明は、自局配下

の無線端末または自局からみてツリー状の転送経路上でルート局と反対方向に位置する無線基地局からのパケット受信時のみショートカット送信し、ショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上でルート局方向に位置する無線基地局へ転送しない点異なる。

【0020】また、従来技術2が無線端末による探索フレームと全経路探索フレームのブロードキャスト送信を必要とするのに対して、この発明は、無線端末による探索フレームと全経路探索フレームのブロードキャスト送信を必要としない点異なる。

【0021】この発明では、自局方向に転送されるパケットをモニタした無線基地局は、送信元無線端末を送信局アドレスの示す無線基地局配下、あるいは送信局アドレスの示す無線基地局からみて自局と反対方向に位置する無線基地局配下と判断して、テーブルに登録し、パケット転送時に、宛先無線端末がテーブルに登録済みの場合は、対応づけられている無線基地局へショートカット送信することにより、パケットの転送経路が冗長になることが防止可能となり、転送遅延時間の増加とスループットの低下を防止することが可能となる。

【0022】また、無線基地局は、帰属中の無線端末または自局からみてツリー状の転送経路上でルート局と反対方向に位置する無線基地局からパケットを受信した時のみショートカット送信し、このショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上でルート局と同じ方向に位置する無線基地局へ転送することを禁止することにより、転送パケットがループすることが防止可能となり、同一パケットの複数回受信とスループットの低下を防止することが可能となる。

【0023】また、無線基地局は、他の無線基地局が送信するパケットをモニタすることにより、無線端末がパケット送信に先立ち、探索フレームや全経路探索フレームのブロードキャスト送信をすることなくショートカット送信が可能となり、無線端末間の探索フレームや全経路探索フレームのブロードキャスト送信に伴うスループットの低下と無線端末の制御負荷の増加が防止可能となる。

【0024】請求項2にかかる無線パケット転送方法は、前記各無線基地局において、他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタして、前記パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録することを特徴とする。

【0025】この発明では、無線基地局が自局方向のパケットをモニタするのに加えて、ショートカットにより送信されるパケットをモニタし、送信元無線端末を送信局アドレスが示す無線基地局配下、あるいは送信局アドレスが示す無線基地局からみて自局と反対方向に位置する無線基地局配下と判断して、テーブルに登録し、パケ

ット転送時に、宛先無線端末がテーブルに登録済みの場合は、対応づけられている無線基地局へショートカット送信することにより、パケットの転送経路が冗長に成ることを防止し、転送遅延時間の増加とスループットの低下を防止することができるという効果が得られる。

【0026】請求項3にかかる無線パケット転送方法は、前記各無線基地局において、他無線基地局から前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタした場合または他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタした場合であって、当該パケットの送信元無線端末が前記テーブルに登録されている場合、モニタされた当該パケットの送信局アドレスが示す無線基地局から前記ツリー状の転送経路に従い自局までパケットを中継するのに要する第1の無線基地局数と、前記送信元無線端末と対応づけて前記テーブルに登録された無線基地局から前記ツリー状の転送経路に従い自局までパケットを中継するのに要する第2の無線基地局数とを比較し、第1の無線基地局数が第2の無線基地局数以上であることを条件に当該パケットの送信局アドレスが示す無線基地局を前記送信元無線端末と対応づけて前記テーブルに登録更新することを特徴とする。

【0027】この発明では、パケットをモニタした無線基地局は、ツリー経路距離のより大きい無線基地局を送信元の無線端末と対応づけてショートカットテーブルに登録することにより、ショートカット送信による転送経路の冗長削減量をより増やすことが可能となり、転送遅延時間の増加とスループットの低下を防止することができるという効果が得られる。

【0028】請求項4にかかる無線パケット転送方法は、前記各無線基地局において、他無線基地局から前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタした場合または他無線基地局から前記ツリー状の転送経路をショートカットして転送されるパケットをモニタした場合であって、当該パケットの送信元無線端末が前記テーブルに登録されている場合、モニタされた当該パケットの送信局アドレスが示す無線基地局が、前記ツリー状の転送経路上において前記送信元無線端末と対応づけて前記テーブルに登録中の無線基地局と自局との間に位置しないこと、または前記送信局アドレスが示す無線基地局が、前記送信元無線端末と対応づけて前記テーブルに登録中の無線基地局に一致することを条件として、モニタされた当該パケットの送信局アドレスが示す無線基地局を前記送信元無線端末と対応づけて前記テーブルに登録更新することを特徴とする。

【0029】この発明では、パケットをモニタした無線基地局は、送信局アドレスが示す無線基地局が、ツリー状の転送経路上、送信元無線端末と対応づけてテーブルに登録中の無線基地局と自局との間に位置しない場合は、無線端末が別の無線基地局の配下へ移動したものと

判断して、テーブルに登録更新することにより、無線基地局が無線端末移動前の情報に基づきショートカット送信し続けることを防止する効果が得られる。

【0030】また、ツリー経路距離のより大きい無線基地局を送信元無線端末と対応づけてテーブルに登録することができ、ショートカット送信による転送経路の冗長削減量をより増やし、転送遅延時間の増加とスループットの低下を防止することができるという効果が得られる。

【0031】請求項5にかかる無線パケット転送方法は、特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線パケット通信網における無線パケット転送方法であって、前記各無線基地局において、他無線基地局に帰属中の無線端末が送信するパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする。

【0032】前述の従来技術1では、無線基地局はツリー状の転送経路上で隣接する無線基地局のみを次転送先無線基地局として選択してパケットを転送するのに対し、この発明では、他無線基地局に帰属中の無線端末が送信するパケットをモニタして、テーブルに宛先無線端末と送信局無線基地局とを対応づけて登録し、宛先無線端末がテーブルに登録中の場合にはツリー状の転送経路上では隣接していない無線基地局を次転送先無線基地局に選択してパケットをショートカット送信する点が異なる。

【0033】また、単純にツリー状の転送経路上で隣接していない無線基地局を次転送先無線基地局に選択してパケット転送する方法に対して、この発明は、自局配下の無線端末または自局からみてツリー状の転送経路上でルート局と反対方向に位置する無線基地局からのパケット受信時のみショートカット送信し、ショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上でルート局方向に位置する無線基地局へ転送しない点が異なる。

【0034】また、従来技術2が無線端末による探索フ

フレームと全経路探索フレームのブロードキャスト送信を必要とするのに対して、この発明は、無線端末による探索フレームと全経路探索フレームのブロードキャスト送信を必要としない点異なる。

【0035】この発明では、他無線基地局に帰属中の無線端末が送信するパケットをモニタした無線基地局は、送信元無線端末が、送信局アドレスの示す無線基地配下と判断して、テーブルに登録し、パケット転送時に、宛先無線端末がテーブルに登録済みの場合は、対応づけられている無線基地局へショートカット送信することにより、パケットの転送経路が冗長になることが防止可能となり、転送遅延時間の増加とスループットの低下を防止することが可能となる。

【0036】また、無線基地局は、帰属中の無線端末または自局からみてツリー状の転送経路上ルート局と反対方向に位置する無線基地局からパケットを受信した時のみショートカット送信し、このショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上ルート局と同じ方向に位置する無線基地局へ転送することを禁止することにより、転送パケットがループすることが防止可能となり、同一パケットの複数回受信とスループットの低下を防止することが可能となる。

【0037】また、無線基地局は、他の無線基地局が送信するパケットをモニタすることにより、無線端末がパケット送信に先立ち、探索フレームや全経路探索フレームのブロードキャスト送信をすることなくショートカット送信が可能となり、無線端末間の探索フレームや全経路探索フレームのブロードキャスト送信に伴うスループットの低下と無線端末の制御負荷の増加が防止可能となる。

【0038】請求項6にかかる無線パケット転送方法は、特定の無線基地局をルート局としてツリー状の転送経路を構成する複数の無線基地局と各無線基地局に帰属する無線端末とを含む無線パケット通信網におけるパケット無線転送方法であって、前記各無線基地局において、他無線基地局から無線端末に送信されるパケットをモニタして、当該パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局を対応づけてテーブルに登録し、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しない

ことを特徴とする。

【0039】前述の従来技術1では、無線基地局はツリー状の転送経路上で隣接する無線基地局のみを次転送先無線基地局として選択してパケットを転送するのに対して、この発明では、無線基地局は他無線基地局がその配下の無線端末へ送信するパケットをモニタして、テーブルに宛先無線端末と送信局無線基地局とを対応づけて登録し、宛先無線端末がテーブルに登録中の場合にはツリー状の転送経路上では隣接していない無線基地局を次転送先無線基地局に選択してパケットをショートカット送信する点異なる。

【0040】また、単純にツリー状の転送経路上で隣接していない無線基地局を次転送先無線基地局に選択してパケット転送する方法に対して、この発明は、自局配下の無線端末または自局からみてツリー状の転送経路上でルート局と反対方向に位置する無線基地局からのパケット受信時のみショートカット送信し、ショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上でルート局方向に位置する無線基地局へ転送しない点異なる。

【0041】また、従来技術2が無線端末による探索フレームと全経路探索フレームのブロードキャスト送信を必要とするのに対して、この発明は、無線端末による探索フレームと全経路探索フレームのブロードキャスト送信を必要としない点異なる。

【0042】この発明では、他無線基地局が無線端末へ送信するパケットをモニタした無線基地局は、宛先無線端末が、送信局アドレスの示す無線基地配下と判断して、ショートカットテーブルに登録し、パケット転送時に、宛先無線端末がショートカットテーブルに登録済みの場合は、対応づけられている無線基地局へショートカット送信することにより、パケットの転送経路が冗長になることが防止可能となり、転送遅延時間の増加とスループットの低下を防止することが可能となる。

【0043】また、無線基地局は、帰属中の無線端末または自局からみてツリー状の転送経路上でルート局と反対方向に位置する無線基地局からのパケット受信時のみショートカット送信し、ショートカットパケットの受信無線基地局は、自局からみてツリー状の転送経路上でルート局と同じ方向に位置する無線基地局へ転送することを禁止することにより、転送パケットがループすることが防止可能となり、同一パケットの複数回受信とスループットの低下を防止することが可能となる。

【0044】また、無線基地局は、他の無線基地局が送信するパケットをモニタすることにより、探索フレームや全経路探索フレームのブロードキャスト送信をすることなくショートカット送信が可能となり、無線端末間の探索フレームや全経路探索フレームのブロードキャスト送信に伴うスループットの低下と無線端末の制御負荷の増加が防止可能となる。

【0045】請求項7にかかる無線パケット転送方法は、前記各無線基地局において、接続通知パケットと接続通知応答パケットを定義し、前記接続通知パケットと前記接続通知応答パケットは、そのデータ部に経路情報フィールドを持ち、前記経路情報フィールドは当該パケットを転送した全ての前記無線基地局の転送順番を示し、新たにツリー状の転送経路に接続した無線基地局において、ツリー状の転送経路上隣接する無線基地局へ前記接続通知パケットを送信し、前記接続通知パケットを受信した前記隣接する無線基地局において、前記経路情報フィールドから当該接続通知パケットの送信元無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新し、また当該接続通知パケットの送信元アドレスを接続通知応答パケットの宛先アドレスに入力して前記接続通知応答パケットを送信し、自局のアドレスを当該接続通知パケットの前記経路情報フィールドに追加入力して前記接続通知パケットの送信局アドレスが示す無線基地局を除くツリー状の転送経路上隣接する全ての無線基地局へ転送し、前記接続通知応答パケットを受信した無線基地局において、前記経路情報フィールドから当該接続通知応答パケットの送信元無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新し、当該接続通知応答パケットの宛先アドレスが自局のアドレスに一致しない場合、自局のアドレスを当該接続通知応答パケットの経路情報フィールドに追加入力して転送することを特徴とする。

【0046】この発明は、ツリー状の転送経路に新たに接続した無線基地局が、パケットを転送した無線基地局の履歴を示す経路情報フィールドを有する接続通知パケットを送信し、この接続通知パケットを受信したツリー状の転送経路上の他の無線基地局が、前記経路情報フィールドからツリー状の転送経路に新たに接続した無線基地局のツリー状の転送経路上における位置を把握する点において、従来技術と異なる。

【0047】この発明によれば、接続通知パケットにより、新たにツリー状の転送経路に接続した無線基地局のツリー状の転送経路上における位置を他の無線基地局が把握することができ、他の無線基地局が経路探索フレームを送信しないため、スループットの低下を防止する効果と位置関係を把握するまでの時間を短縮する効果が得られる。

【0048】請求項8にかかる無線パケット転送方法は、前記各無線基地局において、前記無線基地局間を転送するパケットに、接続追加パケットと経路通知パケットを定義し、前記接続追加パケットは、そのデータ部に接続無線基地局フィールドを持ち、前記接続無線基地局フィールドは当該接続追加パケットの送信元無線基地局が新たに接続した無線基地局のアドレスを示し、前記経路通知パケットは、そのデータ部に経路情報テーブルフィールドを持ち、前記経路情報テーブルフィールドは、

当該パケットの送信元無線基地局が把握しているツリー状の転送経路上における無線基地局間の相互の位置関係を示し、新たにツリー状の転送経路に接続した無線基地局において、通信路を接続した無線基地局宛に前記接続追加パケットを送信し、ツリー状の転送経路上隣接する無線基地局を送信元とする前記接続追加パケットを受信した無線基地局において、当該接続追加パケットの送信元無線基地局へ前記経路通知パケットを送信し、また当該接続追加パケットを当該接続通知パケットの送信局アドレスが示す無線基地局以外でツリー状の転送経路上隣接する無線基地局へ転送し、ツリー状の転送経路上隣接する無線基地局以外を送信元とする前記接続追加パケットを受信した無線基地局において、前記接続通知パケットの送信元無線基地局が前記接続追加パケットの接続無線基地局フィールドの示す無線基地局と通信路を接続したことを把握してツリー状の転送経路を更新し、また前記接続追加パケットの送信局アドレスが示す無線基地局を除くツリー状の転送経路上隣接する全ての無線基地局へ前記接続追加パケットを転送し、前記経路通知パケットを受信した無線基地局において、前記経路情報テーブルフィールドから他の無線基地局のツリー状の転送経路上における位置を把握してツリー状の転送経路を更新することを特徴とする。

【0049】この発明は、ツリー状の転送経路に新たに接続した無線基地局が、接続先無線基地局へ接続先無線基地局の例えばMACアドレスを示す接続無線基地局フィールドを含む接続追加パケットを送信し、この接続追加パケットを受信したツリー状の転送経路上の他の無線基地局が、送信元無線基地局、すなわちツリー状の転送経路に新たに接続した無線基地局が前記接続無線基地局フィールドの示す無線基地局と接続したことを把握し、経路通知パケットを受信した前記ツリー状の転送経路に新たに接続した無線基地局は、前記経路情報フィールドから他の前記無線基地局のツリー状の転送経路上における位置を把握する点において、従来技術と異なる。

【0050】この発明によれば、経路通知パケットにより、新たにツリー状の転送経路に接続した無線基地局は、ツリー状の転送経路上における他の無線基地局の位置を把握することができ、他の無線基地局の接続通知応答パケットの送信を要しないため、無線資源の消費をさらに抑制して、スループットの低下をより防止する効果と位置関係を把握するまでの時間をより短縮する効果が得られる。

【0051】請求項9にかかる無線パケット転送方法は、前記各無線基地局において、前記無線基地局間を転送するパケットに、切断通知パケットを定義し、前記切断通知パケットは、データ部に切断無線基地局フィールドを持ち、また、前記各無線基地局において、ツリー状の転送経路上隣接する無線基地局との通信路の切断を検出する機能を有し、前記隣接する無線基地局との通信路

の切断を検出したとき、前記隣接する無線基地局のアドレスを前記切断無線基地局フィールドに入力して、前記切断通知パケットをツリー状の転送経路上の全ての無線基地局へ送信し、前記切断通知パケットを受信した無線基地局において、前記切断無線基地局フィールドの示す無線基地局と前記切断通知パケットの送信元無線基地局との間の通信路が切断したことを把握してツリー状の転送経路を更新することを特徴とする。

【0052】この発明によれば、切断通知パケットにより、ツリー状の転送経路から切断された無線基地局を把握することが可能となり、当該無線基地局と対応づけられてテーブルに登録中の無線端末へのショートカット送信を停止できる効果がある。

【0053】請求項10にかかる無線パケット転送方法は、前記各無線基地局において、ブロードキャストにより送信されるパケットについて、ツリー状の転送経路をショートカットして送信しないことを特徴とする。この発明によれば、ブロードキャストパケットをショートカット送信しないことにより、ブロードキャストにより送信されるパケットがループすることが防止され、同一パケットの複数回受信とスループットの低下を防止する効果が得られる。

【0054】請求項11にかかる無線パケット転送方法は、前記各無線基地局において、無線端末を前記テーブルに登録後、または前記テーブルに登録中の無線端末を登録更新後、あらかじめ定められた期間が経過したとき、前記テーブルに登録された当該無線端末の登録を削除することを特徴とする。この発明によれば、無線端末が通信を終了したとき、予め定められた期間後、テーブルの登録を削除することができ、テーブルに要するメモリ量を抑制する効果が得られる。

【0055】請求項12にかかる無線基地局は、特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、前記ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、前記転送部は、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記転送先として選択された無線基地局に対し前記ツリー状の転送経路をショートカット

してパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする。

【0056】請求項13にかかる無線基地局は、特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、他無線基地局に帰属中の無線端末が送信するパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と受信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、前記転送部は、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする。

【0057】請求項14にかかる無線基地局は、特定の無線基地局をルート局としてツリー状の転送経路を構成する無線パケット通信網における無線基地局であって、パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて登録するためのテーブルと、他無線基地局から無線端末に送信されるパケットをモニタして、当該パケットの宛先アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけて前記テーブルに登録するモニタ部と、前記テーブルを参照して、自局に帰属中の無線端末または他無線基地局からのパケットを転送する転送部とを備え、前記転送部は、自局に帰属中の無線端末または自局からみて前記ルート局と反対方向に位置する前記ツリー状の転送経路上の無線基地局からパケットを受信した場合、当該パケットの宛先アドレスで示される宛先無線端末が前記テーブルに登録されていることを条件として前記宛先無線端末に対応づけられた無線基地局を転送先として選択し、前記ツリー状の転送経路をショートカットして前記転送先として選択された無線基地局にパケットを送信し、他無線基地局から前記ツリー状の転送経路をショートカットして送信されたパケットを受信した場合、自局からみて前記

ルート局と同じ方向に位置する前記ツリー状の転送経路上の無線基地局を転送先として選択しないことを特徴とする。

【0058】

【発明の実施の形態】以下、この発明の実施の形態について、図面を参照しながら説明する。図1は、この実施の形態にかかる無線パケット通信網で用いられる無線基地局APの特徴部を示す概略構成図である。同図に示す無線基地局APは、例えばスパニング・ツリー・プロトコルにより転送経路がツリー状に形成された無線パケット通信網の各ノードに配置されるものであって、ツリー状の転送経路をショートカットしてパケットを送信することに特徴を有するものである。

【0059】なお、他の機能については、通常の無線基地局と同様である。例えば、他の無線基地局からパケットを受信した場合、または、帰属中の無線端末からパケットを受信した場合には、前記パケットの宛先無線端末が自局に帰属中のときはこの端末にパケットを転送し、また、宛先無線端末が自局に帰属中でないときには、次の転送先である無線基地局にパケットを転送する。

【0060】図1において、パケットモニタ部1（モニタ部）は、ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットを送信する無線端末と無線基地局とをショートカットテーブル2（テーブル）に登録するものである。ショートカットテーブル2には、モニタされたパケット（すなわち自局方向に近づく方向に転送されたパケット）の送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とが互いに対応づけられて登録される。

【0061】パケット転送部3（転送部）は、自局に帰属中の無線端末または他無線基地局からのパケットを転送するものであり、ショートカットテーブル2を参照することにより正規の転送経路（ツリー状の転送経路）をショートカットしてパケットを転送する機能を有する。なお、各無線基地局と各無線端末は、識別子として装置固有のアドレス（MACアドレス）を有する。

【0062】図2に、この実施の形態にかかる無線パケット通信網で転送されるパケットのフォーマットを示す。同図に示すように、各パケットは、制御信号を入力するヘッダ部と転送データを入力するデータ部から構成される。パケットAは、無線端末から無線基地局への転送パケットに用いるものであって、「フォーマット種別」、「受信局アドレス」、「送信元アドレス」、「宛先アドレス」、「予約」からなるヘッダ部を有する。

【0063】また、パケットBは、無線基地局間でのパケット転送に用いるものであって、「フォーマット種別」と、「受信局アドレス」、「送信局アドレス」、「宛先アドレス」、「送信元アドレス」の4種類のアドレスフィールドからなるヘッダ部を有する。パケットCは、無線基地局から無線端末への転送パケットに用いる

ものであって、「フォーマット種別」、「宛先アドレス」、「送信局アドレス」、「送信元アドレス」、「予約」からなるヘッダ部を有する。

【0064】ここで、宛先アドレスは、パケットの宛先の無線端末のMACアドレスを示し、送信元アドレスは、パケットの送信元無線端末のMACアドレスを示し、受信局アドレスは、転送先（現在の無線基地局からパケットを受信する無線基地局）の無線基地局のMACアドレスを示し、送信局アドレスは転送元（現在の無線基地局にパケットを送信する無線基地局）の無線基地局のMACアドレスを示す。

【0065】また、新たに無線基地局を無線パケット通信網に接続した場合に使用される後述の接続通知パケットと接続通知応答用パケットは経路情報フィールドをそれぞれ持ち、この経路情報フィールドには、送信元無線基地局のMACアドレスを先頭に、当該パケットを中継した無線基地局のMACアドレスが中継順に入力される。

【0066】次に、この実施の形態にかかる無線基地局の基本動作について、後述の図7および図8に示すツリー状の転送経路をなす無線パケット通信網を例とし、図3～図6に示すフローチャートに沿って説明する。ここで、図7において、無線基地局AP3とAP7、無線基地局AP3とAP4、無線基地局AP3とAP6との間には転送経路が設定されていないが、お互いの間には電波の遮蔽物がなく、互いの送信パケットはモニタ可能とする。

【0067】また、2つの無線基地間をツリー状の転送経路上パケット転送する時に要する中継用の無線基地局の数を、無線基地局間の「ツリー経路距離」と定義する。例えば図8において、無線基地局AP3とAP7と間のツリー経路距離は3であり、無線基地局AP3とAP4と間のツリー経路距離は2である。また、ある無線基地局からみて、ツリー状の転送経路上のルート局方向を上位方向とし、反対方向を下位方向とする。

【0068】以下、各無線基地局の基本動作を説明する。なお、以下の基本動作において、パケットをモニタしてショートカットテーブル2に登録・更新する動作については主としてパケットモニタ部1により行われ、ショートカットテーブル2を参照して転送先を決定する動作については主としてパケット転送部3により行われる。また、その他の各種の制御・判定動作については、パケットモニタ部1、パケット転送部3以外の機能により実現される。ただし、これらの機能（基本動作）については、必ずしもパケットモニタ部1やパケット転送部3の機能として割り付ける必要はなく、無線基地局の機能としてソフトウェア上で実現してもよい。

【0069】（基本動作1）各無線基地局は、周囲の無線基地局が送信するパケットを受信して、パケットBをモニタする（ステップS01）。ここで、パケットB

がモニタされた場合（ステップS02：YES）、このパケットの送信局アドレスが示す無線基地局（送信局AP）がツリー状の転送経路上隣接する無線基地局ではなく（ステップS03：NO）、しかもこのパケットBが自局方向に転送されるパケット（自局方向パケット）であって（ステップS04：YES）、送信元の無線端末が未登録ならば（ステップS05：NO）、送信元の無線基地局を当該パケットの送信局APと対応づけてショートカットテーブル2に登録し（請求項1、12参照）、登録保留タイマをスタートする（ステップS06）。ただし、送信局APがツリー状の転送経路上、隣接する無線基地局である場合（ステップS03：YES）には登録しない。

【0070】（基本動作2） 各無線基地局は、パケットBの送信局APと受信局アドレスが示す無線基地局（受信局AP）がツリー状の転送経路上隣接していない場合であって、自局方向のパケットではない場合（ステップS04：NO）、ショートカット送信されたパケット（ショートカットパケット）であると判断する（ステップS07：YES）。

【0071】このとき、送信元の無線端末（送信元STA）が未登録ならば（ステップS05：NO）、送信元STAを送信局APと対応づけてショートカットテーブル2に登録する（請求項2参照）。ただし、送信局APがツリー状の転送経路上、隣接する無線基地局である場合には登録しない。また、ショートカットテーブル登録時、登録保留タイマをスタートする。

【0072】（基本動作3） 各無線基地局は、送信元STAがショートカットテーブル2に登録中の場合（ステップS05：YES）、自局と送信局APとの間のツリー経路距離（第1の無線基地局数）が、自局と登録中の無線端末に対応づけられている無線基地局との間のツリー経路距離（第2の無線基地局数）以上であるとき（ステップS08：YES）、対応づけられている無線基地局を送信局APとして登録更新する（ステップS09）（請求項3参照）。登録更新時、登録保留タイマをリスタートする。

【0073】（基本動作4） 各無線基地局は、送信局APが、ショートカットテーブル2に登録中の無線端末に対応づけられている無線基地局と自局との間のツリー状の転送経路上に位置しないとき、または登録中の無線端末（登録中STA）に対応づけられている無線基地局と一致するとき（ステップS08：YES）、対応づけられている無線基地局を送信局APに登録更新する（ステップS09）（請求項4参照）。登録更新時、登録保留タイマをリスタートする。なお、上述の基本動作3と基本動作4は同時には行われず、いずれかが予め選択される。

【0074】（基本動作5） 各無線基地局は、周囲のAPが送信するパケットCをモニタし（ステップS0

1：NO～ステップS10：YES）、宛先の無線端末（宛先STA）と送信局APをショートカットテーブル2に登録する（ステップS11～S13）（請求項6、14参照）。ただし、送信局APがツリー状の転送経路上、隣接する無線基地局の場合（ステップS11：YES）には登録しない。宛先STAが登録済みの場合（ステップS12：YES）にはショートカットテーブル2を登録更新し（ステップS14）、登録保留タイマをリスタートする。

【0075】（基本動作6） 各無線基地局は、周囲の無線端末が送信するパケットAをモニタし（ステップS01：NO～ステップS10：NO）、送信元STAと受信局APをショートカットテーブル2に登録する（ステップS20～S23）（請求項5、13参照）。ただし、受信局APがツリー状の転送経路上、隣接する無線基地局の場合（ステップS21：YES）には登録しない。送信元STAが登録済みの場合（ステップS22：YES）にはショートカットテーブル2を登録更新し（ステップS24）、登録保留タイマをリスタートする。

【0076】（基本動作7） 各無線基地局は、受信局APが自局の場合（ステップS30：YES）、受信パケットがブロードキャストパケットのときには（ステップS31：YES）、帰属中の無線端末へブロードキャスト送信するとともに、受信パケットの送信局APを除くツリー状の転送経路上隣接する全無線基地局を受信局APとして順次パケットBを転送する（ステップS32）。ただし、この場合、ショートカットによる転送は行わない（請求項10参照）。これにより、ブロードキャストにより送信されたパケットが経路上をループすることを防止する。

（基本動作8） 各無線基地局は、宛先STAが自局配下に帰属中の無線端末である場合は（ステップS33：YES）、宛先STAへパケットAを送信する（ステップS34）（全請求項共通）。

【0077】（基本動作9） 各無線基地局は、帰属中の無線端末からパケットAを受信した時（ステップS35：YES）、または下位方向の無線基地局（下位AP）からパケットBを受信した時（ステップS36：YES）、宛先STAがショートカットテーブル2に登録中の場合は（ステップS37：YES）、対応づけられている無線基地局を受信局APとして、この無線基地局にパケットBをショートカット送信する（ステップS38）。未登録の場合は（ステップS37：NO）、送信局APを除くツリー状の転送経路上隣接する全無線基地局へ順次パケットBを転送する（ステップS39）（全請求項共通）。

【0078】（基本動作10） 各無線基地局は、ショートカットパケットを受信した時は（ステップS40：YES）、下位方向の無線基地局（下位AP）へパケッ

トBを転送する(ステップS41)(全請求項共通)。このとき、上位APへパケットが転送されないため、ループの発生は防止される。

(基本動作11) 上位方向の無線基地局(上位AP)からパケットBを受信した時、すなわち受信パケットがショートカットパケットではない場合(ステップS40:NO)、送信局APを除くツリー状の転送経路上隣接する全無線基地局へ順次パケットBを転送する(ステップS42)。このとき、上位APからの受信パケットはショートカット転送されないため、ループの発生は防止される。

【0079】(基本動作12) 各無線基地局は、ショートカットテーブル2に登録中の各無線端末に1対1で対応する登録保留を有し、各無線端末の登録を更新するためのパケットの連続未受信時間を計測する。各無線基地局は、登録保留タイマにより連続未受信時間を計測し、或る無線端末が登録されてから、当該無線端末を登録更新しないまま、あらかじめ定められた時間が経過して、登録保留タイマがタイムアウトになったとき(ステップS50)、その無線端末(対応するSTA)の登録をショートカットテーブル2より削除する(ステップS51)(請求項11参照)。

【0080】また、各無線基地局は、ツリー状の転送経路からなる無線パケット通信網に対して通信路を接続/切断するため、以下の基本動作を行う。

(基本動作13) 各無線基地局は、接続通知パケットと接続通知応答パケットを定義し、新たにツリー状の転送経路に接続した場合、接続通知パケットに無線基地局の転送順番を入力してツリー状の転送経路上における自局の位置を他無線基地局に知らせ、また接続通知パケットを受信した場合、当該接続通知パケットの送信元アドレスを接続通知応答パケットの宛先アドレスに入力して自局の位置を他無線基地局に知らせる(請求項7参照)。

【0081】(基本動作14) 各無線基地局は、新たに接続した無線基地局のアドレスを示す接続追加パケットと無線基地局間の相互の位置関係を示す経路通知パケットとを定義し、通信路を接続した無線基地局宛に接続追加パケットを送信して他の各無線基地局に転送し、経路追加パケットを受信した場合、接続追加パケットの送信元無線基地局へ経路通知パケットを送信して自局の位置を知らせる(請求項8参照)。

【0082】(基本動作15) 各無線基地局は、ツリー状の転送経路上隣接する無線基地局との通信路の切断を検出する機能を有し、無線基地局間を転送するパケットに通信路を切断したことを示す切断通知パケットを定義し、この切断通知パケットをツリー状の転送経路上の全ての無線基地局へ送信し、切断通知パケットを受信した場合、このパケットが示す無線基地局間の通信路が切断したことを把握する(請求項9参照)。

【0083】次に、上述の基本動作を有する無線基地局による無線パケット通信網の構成例と、各無線基地局の動作を説明する。図7に、この実施の形態にかかる無線基地局の配置例を示す。同図において、無線端末STA1は無線基地局AP1に帰属し、無線端末STA3は無線基地局AP3に帰属し、無線端末STA5は無線基地局AP5に帰属し、無線端末STA6は無線基地局AP6に帰属し、無線端末STA7は無線基地局AP7に帰属しているものとする。また、同図において、斜線が付された図形部分は、電波の遮蔽物を表すものとし、無線基地局間の転送経路が設定されない領域とする。

【0084】一般に、無線パケット通信網などの無線LANでは、各無線基地局(AP)は自局のMACアドレスを付与したビーコン信号を自セル内に周期的に送信する。各無線端末(STA)はビーコン信号の送信元APへ帰属信号を送信する。これを受信した無線基地局は帰属信号の送信元STAを帰属中とし、この帰属中の無線端末へのパケットの送信や、この無線端末からのパケットの受信/転送を行う。各無線基地局は信頼性向上のために帰属完了を無線端末へ通知してもよい。

【0085】無線パケット通信網を構成する場合、各無線基地局は、特定の無線基地局をルート局として、例えばスパンニング・ツリー・プロトコルによりツリー状の転送経路を設定する。ただし、図7において、ルート局を無線基地局AP1とし、各無線基地局のパスコストはすべて同じ値とする。続いて、各無線基地局は、他の無線基地局のツリー状の転送経路上における位置を把握し、転送経路に関する情報を構築する。

【0086】ここで、図7において、無線基地局AP7が新たにツリー状の転送経路に接続された場合を例とし、転送経路に関する情報の構築方法として、上述の基本動作13(請求項7参照)を用いた場合について説明する。この場合、無線基地局AP7は、無線基地局AP4に接続されたことを通知するための接続通知パケットを無線基地局AP4へ送信する。これを受信した無線基地局AP4は、接続通知パケットを受信したことを通知するための接続通知応答パケットを無線基地局AP7に送信すると共に、自局のMACアドレスを接続通知パケットの経路情報フィールドに追加入力して、この接続通知パケットを隣接する無線基地局AP1とAP6へ転送する。

【0087】以下同様に転送されて、無線基地局AP7から送信された接続通知パケットは全無線基地局へ送信され、これを受信した各無線基地局は接続通知応答パケットを無線基地局AP7宛に送信する。この結果、例えば無線基地局AP5が受信する接続通知パケットの経路情報フィールドには、無線基地局AP7, AP4, , AP1, AP2, AP3の各MACアドレスが順番に入力される。また、新たに接続された無線基地局AP7は、他の無線基地局からの接続通知応答パケットにより各無

線基地局のツリー状の転送経路上における位置を知る。また、他の無線基地局は接続通知パケットにより無線基地局AP7の位置を知る。図8に、スパニング・ツリー・プロトコルを用いて図7に示す各無線基地局により設定された最終的なツリー状の転送経路を示す。

【0088】次に、図7において、無線基地局AP7が新たにツリー状の転送経路（無線基地局4）に接続された場合の転送経路に関する情報の他の構築方法（請求項8参照）として、上述の基本動作14を用いた場合について説明する。この方法によれば、無線基地局AP7は、無線基地局AP4に追加接続されたことを表す接続追加パケットを無線基地局AP4へ送信する。これを受信した無線基地局AP4は、当該接続追加パケットを隣接する無線基地局AP1とAP6へ転送し、また無線基地局AP7宛に経路通知パケットを送信する。

【0089】無線基地局AP7から送信された接続追加パケットは全無線基地局へ転送され、接続追加パケットを受信した他の無線基地局は、無線基地局AP7が無線基地局AP4との間に通信路を接続したことを把握する。無線基地局AP7は、経路通知パケットの経路情報テーブルフィールドから他の無線基地局のツリー状の転送経路上における位置を知る。この経路情報テーブルフィールドは、例えば経路情報テーブルパケットの送信元無線基地局を起点とした各無線基地局のMACアドレスのリストとして表される。例えば無線基地局AP4の送信する経路情報テーブルフィールドは、（AP4, AP6）（AP4, AP1, AP2, AP3, AP5）として表される。

【0090】以下、この実施の形態にかかる無線基地局の動作として、図8に示す無線パケット通信網（ツリー状の転送経路）において転送経路をショートカットしてパケットを転送する場合の動作を説明する。図9に、無線端末STA7とSTA3との間の通信を例として、ツリー状の転送経路をショートカットしてパケット送信する送信例1を示す。ただし、初期状態において全無線基地局のショートカットテーブル2には、無線端末が1つも登録されていないものとする。

【0091】まず、無線端末STA7が無線端末STA3宛にパケットを送信する場合を説明する。無線端末STA7から無線端末STA3宛のパケットが送信されると、無線端末STA7が帰属する無線基地局AP7は、無線端末STA7からパケットAを受信時、宛先無線端末STA3が帰属中でなく、かつ無線端末STA3がショートカットテーブル2に未登録なため、ツリー状の転送経路で隣接する無線基地局AP4へパケットを転送する。無線基地局AP3は、無線基地局AP7が送信するパケットBをモニタし、無線基地局AP7からAP1に転送されるパケットの転送方向が自局方向であるため、送信元の無線端末STA7と送信局である無線基地局AP7をショートカットテーブル2に登録し、登録保留タ

イマをスタートする。

【0092】無線基地局AP4も無線端末STA3が帰属中でなく、かつショートカットテーブルに未登録なため、ツリー状の転送経路で隣接する無線基地局AP1とAP6へパケットを転送する。無線基地局AP3は、無線基地局AP4が送信するパケットをモニタし、無線基地局AP4からAP1に転送されるパケットが自局方向ではあるが、送信元の無線端末STA7がショートカットテーブル登録中であり、かつ送信局である無線基地局AP4がツリー状の転送経路上登録中の無線基地局AP7と自局の間に位置するため、ショートカットテーブルの登録を更新しない。

【0093】無線基地局AP4からのパケットは、無線基地局AP1, AP2を経由して無線基地局AP3へ転送され、無線基地局AP3は無線端末STA3へパケットCを送信する。無線基地局AP7とAP4とAP6は、無線基地局AP3が無線端末STA3へ送信するパケットCをモニタし、宛先無線端末STA3と送信局である無線基地局AP3を対応づけてショートカットテーブル2に登録し、登録保留タイマをスタートする。以上により、無線端末STA7から送信されたパケットが無線端末STA3に受信される。

【0094】続いて、この後、無線端末STA3が無線端末STA7宛にパケットを送信する場合を説明する。この場合、無線基地局AP3は無線端末STA7がショートカットテーブルに登録中で、かつ帰属中の無線端末から受信したパケットであるため、本来のツリー状の転送経路（この場合、AP3-AP2-AP1-AP4-AP7）をショートカットして、無線基地局AP7へ直接的に送信する。

【0095】無線基地局AP7はショートカットにより送信されたパケット（ショートカットパケット）の送信元の無線端末STA3がショートカットテーブル登録中であり、かつ対応づけられる無線基地局が送信局である無線基地局AP3と一致するため、登録保留タイマをリスタートし、無線端末STA7へパケットCを送信する。以上により、無線端末STA3から送信されたパケットが無線端末STA7に受信される。図10に、上述の送信例1における無線基地局AP3, AP4, AP6, AP7の最終的な各ショートカットテーブル2の内容を示す。

【0096】図11に、無線端末STA6と無線端末STA3との間の通信を例として、ツリー状の転送経路をショートカットしてパケット送信する送信例2を示す。ただし、初期状態において、無線基地局AP3, AP4, AP6, AP7の各ショートカットテーブル2の内容は前述の図10に示すものとし、それ以外の無線基地局のショートカットテーブルには無線端末が1つも登録されていないものとする。また、無線基地局AP3は無線端末STA6が送信するパケットをモニタ可能とす

る。

【0097】無線端末STA6からパケットAが無線基地局AP6へ送信されると、無線基地局AP3はこのパケットAをモニタし、送信元の無線端末STA6と受信局である無線基地局AP6をショートカットテーブル2に登録し、登録保留タイマをスタートする。パケットを受信した無線基地局AP6は、パケットAの宛先端末STA3がショートカットテーブル2に登録中で、かつ帰属中の無線基地局から受信したパケットであるため、対応づけられている無線基地局AP3へパケットBをショートカット送信する。

【0098】このパケットを受信した無線基地局AP3は、ショートカットパケットの送信元の無線端末STA6がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信元の無線基地局AP6と一致するため、登録保留タイマをリスタートし、無線端末STA3へパケットCを送信する。無線基地局AP4とAP6は、パケットCの宛先無線端末STA3がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信局である無線基地局AP3と一致するため、登録保留タイマをリスタートする。以上により、無線端末STA6から送信されたパケットが無線端末STA3に受信される。

【0099】続いて、この後、無線端末STA3が無線端末STA6宛にパケットを送信する場合を説明する。この場合、無線基地局AP3は、無線端末STA6がショートカットテーブル2に登録中で、かつ帰属中の無線端末から受信したパケットであるため、無線基地局AP6へショートカット送信する。無線基地局AP6とAP4とAP7は、ショートカットパケットの送信元の無線端末STA3がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信局である無線基地局AP3と一致するため、登録保留タイマをリスタートし、無線基地局AP6は、無線端末STA7へパケットCを送信する。以上により、無線端末STA3から送信されたパケットが無線端末STA6に受信される。図12に、上述の送信例2における無線基地局AP3、AP4、AP7、AP6の最終的な各ショートカットテーブルの内容を示す。

【0100】図13に、無線端末STA5と無線端末STA6との間の通信を例として、ツリー状の転送経路をショートカットしてパケット送信する送信例3を示す。ただし、初期状態において、無線基地局AP3、AP4、AP7、AP6の各ショートカットテーブル2の内容は前述の図12に示すものとし、それ以外の無線基地局のショートカットテーブルには無線端末が1つも登録されていないものとする。

【0101】無線端末STA5から無線端末STA6宛にパケットAが送信されると、これを受信した無線基地局AP5は、パケットAの宛先端末STA6が帰属中で

はなく（帰属テーブルに未登録）、しかもショートカットテーブル2に未登録なため、ツリー状の転送経路で隣接する全ての無線基地局（ここでは無線基地局AP3のみ）へパケットBを転送する。

【0102】無線基地局AP3は、受信したパケットBがルート局に対して反対方向に位置する無線基地局から受信したものであり、かつ宛先の無線端末STA6がショートカットテーブル2に登録中のため、対応づけられている無線基地局AP6へショートカット送信する。無線基地局AP6は、ショートカットパケットを受信すると、送信元の無線端末STA5と送信局である無線基地局AP3をショートカットテーブル2に登録し、登録保留タイマをスタートする。

【0103】また、無線基地局AP4とAP7は、無線基地局AP6が送信するショートカットパケットをモニタし、送信元の無線端末STA6と送信局である無線基地局AP3をショートカットテーブル2に登録し、登録保留タイマをスタートする。次に、無線基地局AP6は、受信したパケットCを無線端末STA6へ送信する。無線基地局AP3は、このパケットCをモニタし、宛先無線端末STA6がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信局である無線基地局AP6と一致するため、登録保留タイマをリスタートする。

【0104】続いて、この後、無線端末STA6が無線端末STA5宛にパケットを送信する場合を説明する。この場合、無線基地局AP3は無線端末STA6から送信されるパケットAをモニタし、送信元の無線端末STA6がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信局である無線基地局AP6と一致するため、登録保留タイマをリスタートする。

【0105】無線基地局AP6は、無線端末STA5がショートカットテーブル2に登録中であり、かつ帰属中の無線端末から受信したパケットであるため、対応づけられている無線基地局AP3へショートカット送信する。これを受信した無線基地局AP3は、ショートカットパケットの送信元の無線端末STA6と送信局である無線基地局AP6がショートカットテーブル2に登録中であり、かつ対応づけられている無線基地局が送信局である無線基地局AP6と一致するため、登録保留タイマをスタートする。

【0106】次に無線基地局AP3は、宛先の無線端末STA5が帰属中ではなく、かつショートカットテーブル2に未登録なため、ツリー状の転送経路上ルート局と反対方向の隣接局である無線基地局AP5へパケットBを転送する。これにより、転送パケットが経路「AP3→AP2→AP1→AP4→AP3」をループすることを防止する。ただし、経路「AP4→AP3」はショートカット送信による経路である。

【0107】無線基地局AP4とAP6とAP7は、無線基地局AP3から送信されるパケットBをモニタするが、自局方向ではないため、何もしない。パケットを受信した無線基地局AP5は無線端末STA5へパケットCを送信する。以上により、無線端末STA6から送信されたパケットが無線端末STA5に受信される。図14に、上述の送信例3における無線基地局AP3、AP4、AP7、AP6の最終的な各ショートカットテーブルの内容を示す。

【0108】次に、図15に、無線端末STA1と無線端末STA3との間の通信を例として、ツリー状の転送経路をショートカットしないでパケットを転送する送信例を示す。ただし、初期状態において、無線基地局AP3、AP4、AP7、AP6の各ショートカットテーブルの内容は前述の図14に示すものとし、それ以外の無線基地局のショートカットテーブルには無線端末が1つも登録されていないものとする。

【0109】無線端末STA1から無線端末STA3宛のパケットAが送信されると、これを受信した無線基地局AP1は宛先の無線端末STA3が帰属中ではなく、かつショートカットテーブル2に未登録なため、ツリー状の転送経路上で隣接する無線基地局AP2とAP4へパケットを転送する。これを受信した無線基地局AP2は無線基地局AP3へ転送し、無線基地局AP3は無線端末STA3へ送信する。

【0110】一方、無線基地局AP1からパケットを受信した無線基地局AP4は、無線端末STA3がショートカットテーブル2に登録中ではあるが、受信したパケットBが上位方向の無線基地局から受信したものであるため、無線基地局AP3に対しショートカットによる転送を行わない。これにより、無線基地局AP1から無線基地局AP2とAP4に向けて転送されたパケットの一方のみが無線端末STA3に受信され、無線端末STA3が同じパケットを2度受信することが防止される。

【0111】次に、図16に、無線基地局AP7に帰属していた無線端末STA7が、無線基地局AP6の配下に移動した場合の動作（ショートカットテーブルの登録更新）例を示す。無線端末STA7は、無線基地局AP6を経由してパケットを送信する。無線基地局AP4は、無線端末STA7が送信するパケットAをモニタし、無線端末STA7がショートカットテーブルに登録中であって、かつ受信局である無線基地局AP6がツリー状の転送経路上無線基地局AP7（登録中）と自局との間に位置しないため、対応づけを無線基地局AP6に変更し、登録保留タイマをスタートする。

【0112】無線基地局AP4が無線端末STA7から送信されるパケットAをモニタできないときは、無線基地局AP6から送信されるパケットBをモニタし、同様にしてショートカットテーブルの対応付けを変更する。図17に、この例における無線基地局AP3、AP4、

AP7、AP6の最終的な各ショートカットテーブルの内容を示す。

【0113】次に、図18に、無線基地局AP6の配下に移動した無線端末STA7が、ブロードキャスト方式によりパケットを送信する例を示す。ブロードキャスト方式によりパケットを送信する場合、転送経路をショートカットすることによる送信は行われず、パケットは、本来の転送経路であるツリー状の転送経路上を転送される。すなわちこの例では、無線基地局AP6は、無線端末STA7からパケットを受信すると、これを隣接する無線基地局AP4に転送する。

【0114】これを受信した無線基地局AP4は、隣接する無線基地局AP1、AP7に転送する。無線基地局AP1は、無線基地局AP4から転送されたパケットを無線基地局AP2に転送し、無線基地局AP2はこれを無線基地局AP3に転送し、無線基地局AP3はこれを無線基地局AP5に転送する。以上により、無線端末STA7から送信されたパケットは全無線基地局に転送される。

【0115】最後に、ツリー状の転送経路を切断した場合の動作について述べる。各無線基地局は、例えばツリー状の転送経路上隣接する無線基地局が周期的に送信するビーコン信号を監視し、このビーコン信号を連続してN回（N：予め定める閾値）受信できないとき、当該ビーコン信号を発する無線基地局との通信路が切断されたものと判断する。

【0116】例えば、前述の図7において、無線基地局AP4とAP7との間に遮断物が発生して、無線基地局AP4が無線基地局AP7からのビーコン信号を受信できないとき、無線基地局AP4は無線基地局AP7との通信路が切断したものと判断して、無線基地局AP7のMACアドレスが「切断無線基地局フィールド」に入力された切断通知パケットを無線基地局AP6、AP1へ送信する。

【0117】これを受信した無線基地局AP1は無線基地局AP2へ転送し、以下同様にして、切断通知パケットが全無線基地局へ転送される。切断通知パケットを受信した各無線基地局は、無線基地局AP7とAP4との通信路が切断したことを知り、ショートカットテーブルに登録中の無線端末が無線基地局AP7と対応づけられている場合は、その登録を削除し、ショートカットによる送信を停止する。

【0118】以上、この発明の一実施形態を説明したが、この発明は、この実施形態に限られるものではなく、この発明の要旨を逸脱しない範囲の設計変更等があっても本発明に含まれる。例えば、上述の実施の形態では、各無線基地局がショートカットテーブル2を有するものとしたが、このショートカットテーブルは、特定の複数の無線基地局のみが有するものとしてもよく、これら特定の複数の無線基地局のみがショートカット送信を

なし得るものとして構成してもよい。

【0119】

【発明の効果】以上説明したように、この発明によれば以下の効果を得ることができる。すなわち、ツリー状の転送経路上を自局に近づく方向に転送されるパケットをモニタして、当該パケットの送信元アドレスが示す無線端末と送信局アドレスが示す無線基地局とを対応づけてテーブルに登録し、パケットを受信した場合、テーブルを参照して転送先を選択し、前記ツリー状の転送経路をショートカットして送信するようにしたので、冗長な転送経路を経ることなくパケットの転送を行うことができ、転送遅延時間の増加とスループットの低下を防止する効果が得られる。

【0120】また、他無線基地局からツリー状の転送経路をショートカットして送信されたパケットを転送する場合、自局からみてルート局と同じ方向（ツリー状の転送経路の上位方向）に位置する無線基地局を転送先として選択しないようにしたので、転送パケットがループすることを防止でき、同一パケットの複数回受信とスループットの低下を防止する効果が得られる。しかも、無線端末が探索フレームや全経路探索フレームのブロードキャスト送信をすることなく、ショートカット送信が可能となり、スループット低下と無線端末の制御負荷増加を防止することができるという効果が得られる。

【0121】また、パケットの送信局アドレスが示す無線基地局から自局までパケットを中継するのに要する第1の無線基地局数と、送信元無線端末と対応づけてテーブルに登録された無線基地局から自局までパケットを中継するのに要する第2の無線基地局数とを比較してテーブルを更新するようにしたので、ショートカット送信による転送経路の冗長削減量をより増やすことが可能となり、転送遅延時間の増加とスループットの低下をより有効に防止することができるという効果が得られる。

【0122】また、前記各無線基地局において、パケットの送信局アドレスが示す無線基地局が、ツリー状の転送経路上の位置に応じてテーブルを更新するようにしたので、無線端末が移動する前の情報に基づき無線基地局がショートカット送信し続けることを防止することができるという効果が得られる。

【0123】また、無線端末をテーブルに登録後、または前記テーブルに登録中の無線端末を登録更新後、あらかじめ定められた期間が経過したとき、前記テーブルに登録された当該無線端末の登録を削除するようにしたので、無線端末が通信を終了したとき、予め定められた期間の経過後、テーブルの登録を削除することが可能となり、また、無線端末が無線基地局を移動した後、不要な情報を削除することが可能となる。したがって、テーブルに要するメモリ量を抑制することが可能となる効果が得られる。

【0124】また、無線基地局の転送順番を示す接続通

知パケットと自局の位置を示す接続通知応答パケットを定義し、接続通知パケットから送信元無線基地局のツリー状の転送経路上における位置を把握し、自局のアドレスを接続通知応答パケットに入力して隣接する無線基地局へ転送するようにしたので、他の無線基地局が経路探索フレームを送信しないため、スループットの低下を防止することができるという効果が得られる。

【0125】また、新たに接続した無線基地局のアドレスを示す接続追加パケットとツリー状の転送経路上における無線基地局間の相互の位置関係を示す経路通知パケットを定義し、新たにツリー状の転送経路に接続した無線基地局が接続追加パケットを送信し、接続追加パケットを受信した無線基地局が、当該接続追加パケットの送信元無線基地局へ経路通知パケットを送信するようにしたので、他の無線基地局の接続通知応答パケットの送信を要せず、無線資源の消費をさらに抑制してスループットの低下をより効果的に防止することができるという効果を得ることができ、しかもツリー状の転送経路上における位置関係を把握するまでの時間をより短縮することができるという効果を得ることができる。

【0126】また、切断通知パケットを定義し、隣接する無線基地局との通信路の切断を検出したとき、隣接する無線基地局のアドレスを切断通知パケットに入力し、全ての無線基地局へ送信するようにしたので、各無線基地局が、ツリー状の転送経路から切断された無線基地局を把握することが可能となり、この無線基地局に対するショートカット送信を停止させることができるという効果が得られる。

【図面の簡単な説明】

【図1】 この発明の実施の形態にかかる無線基地局の構成を示すブロック図である。

【図2】 この発明の実施の形態にかかるパケットのフォーマットを示す図である。

【図3】 この発明の実施の形態にかかる無線基地局の基本動作1～4を説明するためのフローチャートである。

【図4】 この発明の実施の形態にかかる無線基地局の基本動作5、6を説明するためのフローチャートである。

【図5】 この発明の実施の形態にかかる無線基地局の基本動作7～11を説明するためのフローチャートである。

【図6】 この発明の実施の形態にかかる無線基地局の基本動作12を説明するためのフローチャートである。

【図7】 この発明の実施の形態にかかる無線基地局の配置例を説明するための図である。

【図8】 この発明の実施の形態にかかる無線基地局により構成される無線パケット通信網（ツリー状の転送経路）の一例を示す図である。

【図9】 この発明の実施の形態にかかる無線基地局に

よるパケット送信例1を説明するための図である。

【図10】 この発明の実施の形態にかかるパケット送信例1において作成されるショートカットテーブルの一例を説明するための図である。

【図11】 この発明の実施の形態にかかるパケット送信例2を説明するための図である。

【図12】 この発明の実施の形態にかかるパケット送信例2において作成されるショートカットテーブルの一例を説明するための図である。

【図13】 この発明の実施の形態にかかるパケット送信例3を説明するための図である。

【図14】 この発明の実施の形態にかかるパケット送信例3において作成されるショートカットテーブルの一例を説明するための図である。

【図15】 この発明の実施の形態にかかるパケット送信例（ショートカット送信しない場合）を説明するための図である。

【図16】 この発明の実施の形態にかかるパケット送信例（無線端末が移動した場合）を説明するための図である。

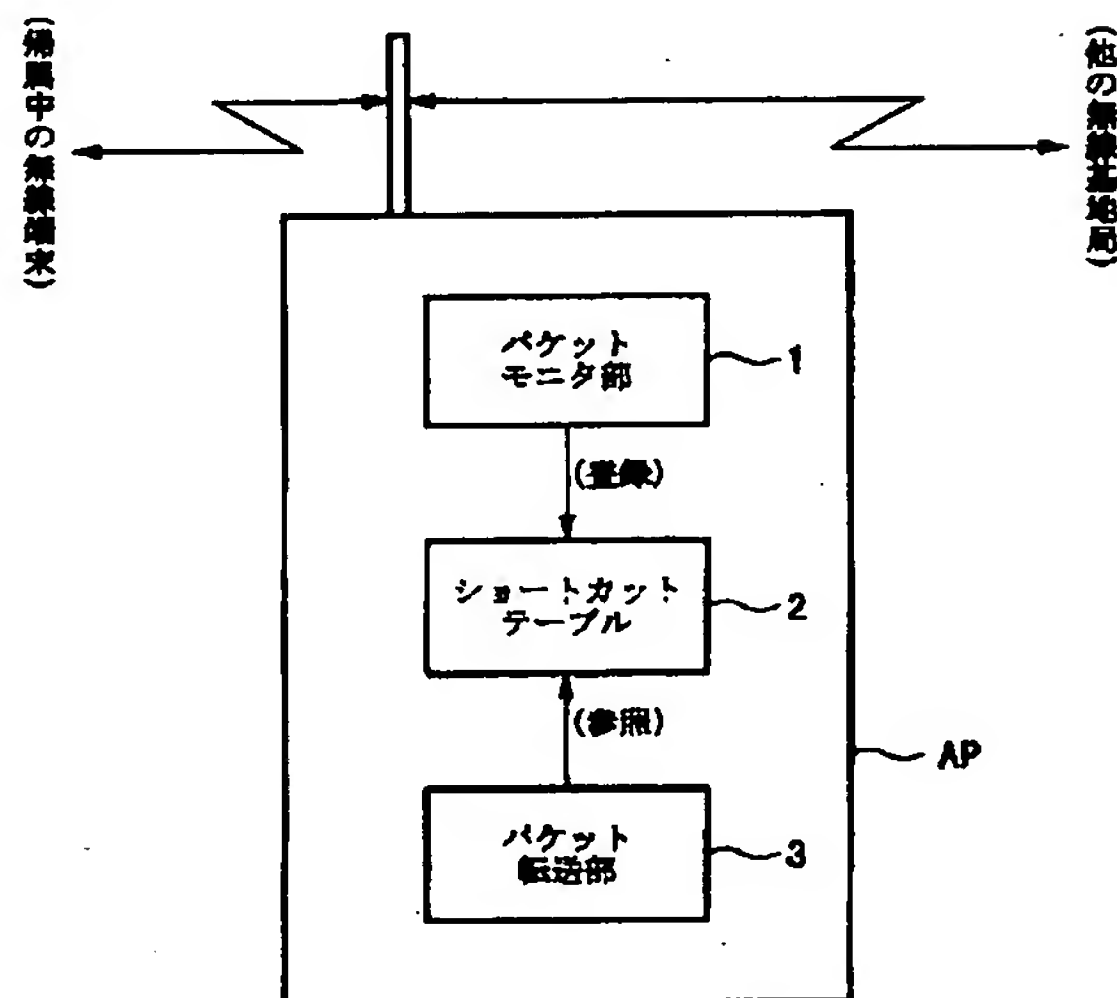
【図17】 この発明の実施の形態にかかるパケット送信例（無線端末が移動した場合）において作成されるショートカットテーブルの一例を説明するための図である。

【図18】 この発明の実施の形態にかかるパケット送信例（ブロードキャスト送信する場合）を説明するための図である。

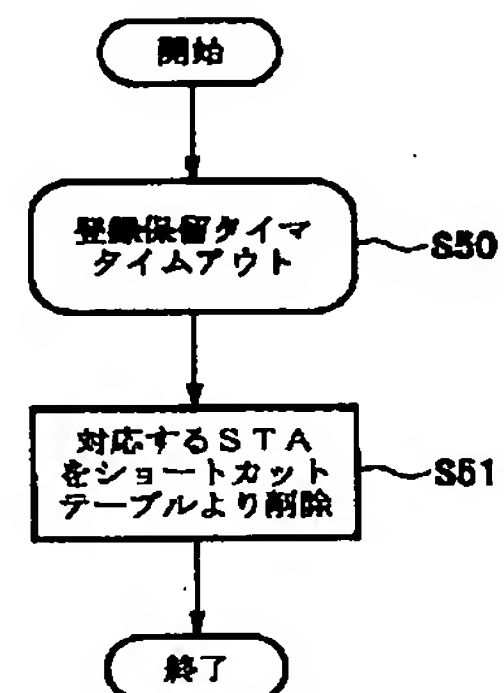
【符号の説明】

AP, AP1~AP7…無線基地局、STA, STA1, STA3~STA7…無線端末、1…パケットモニタ部、2…ショートカットテーブル、3…パケット転送部、S01~S14, S20~S24, S30~S42, S50, S51…ステップ。

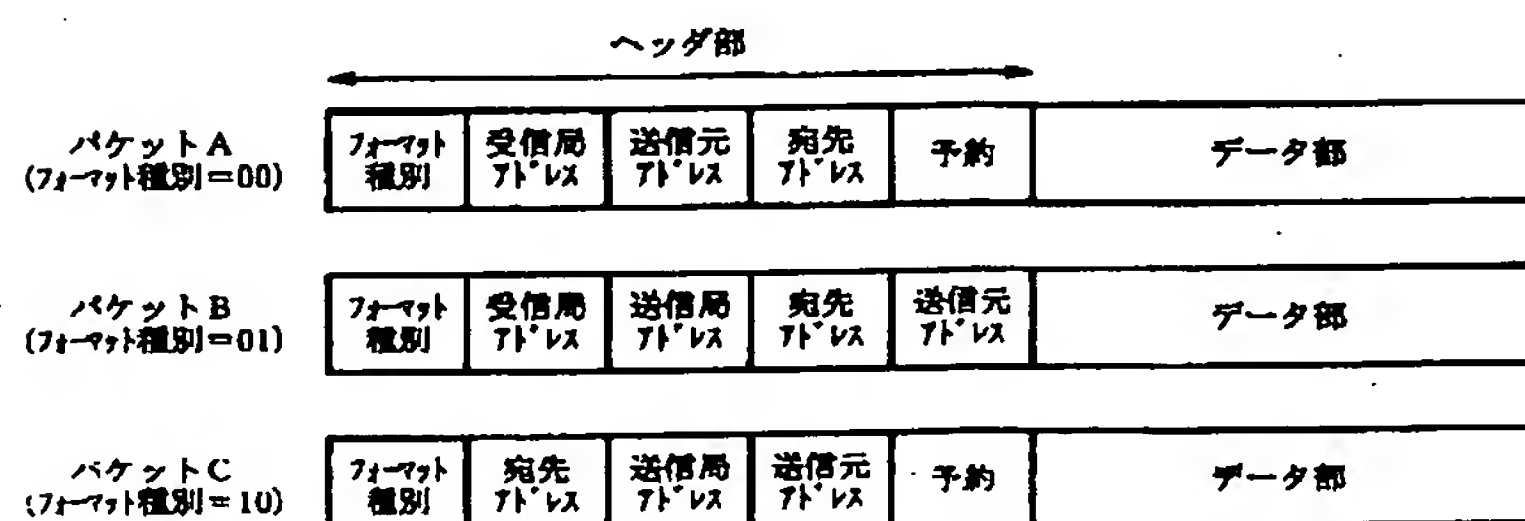
【図1】



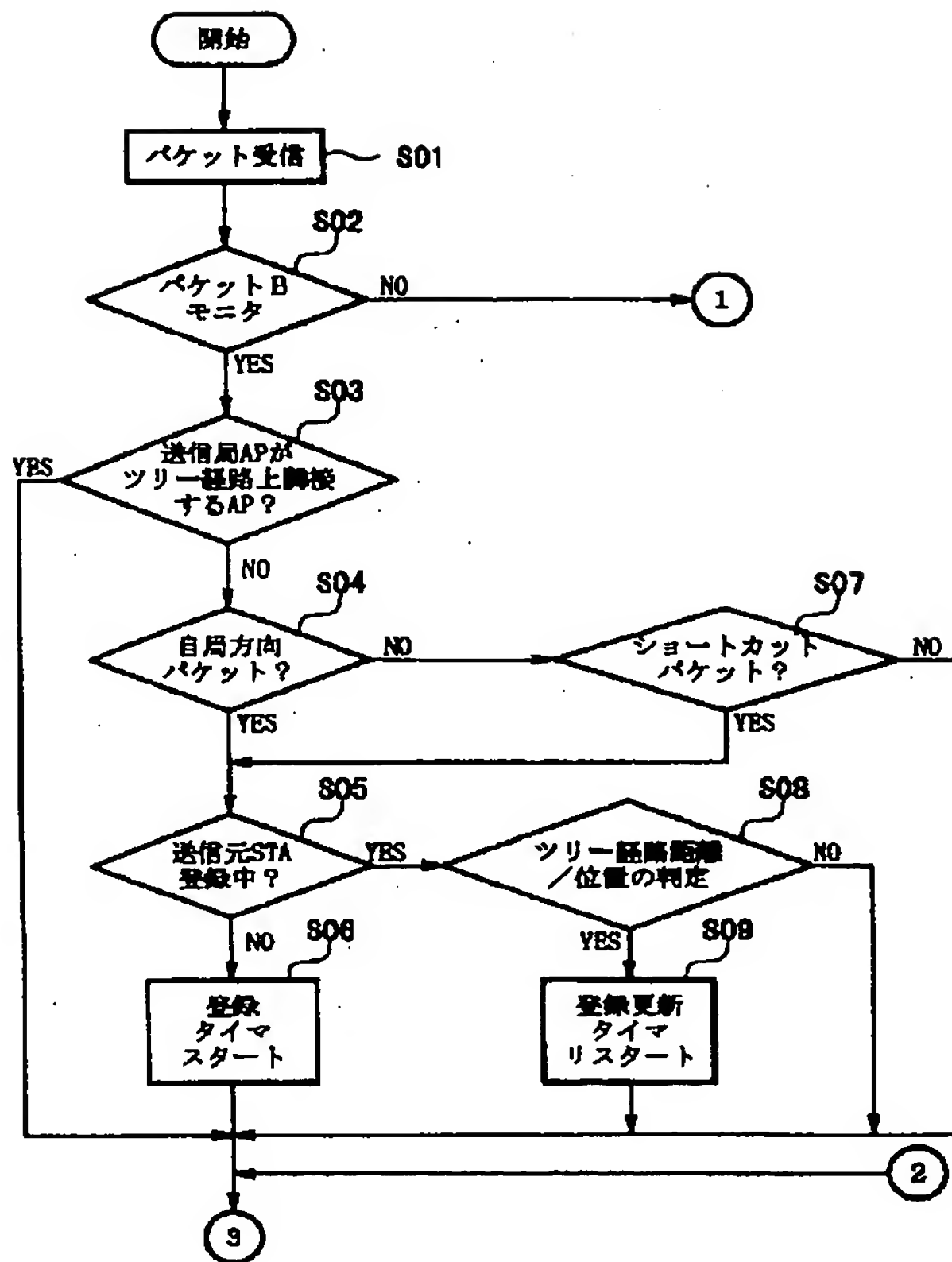
【図6】



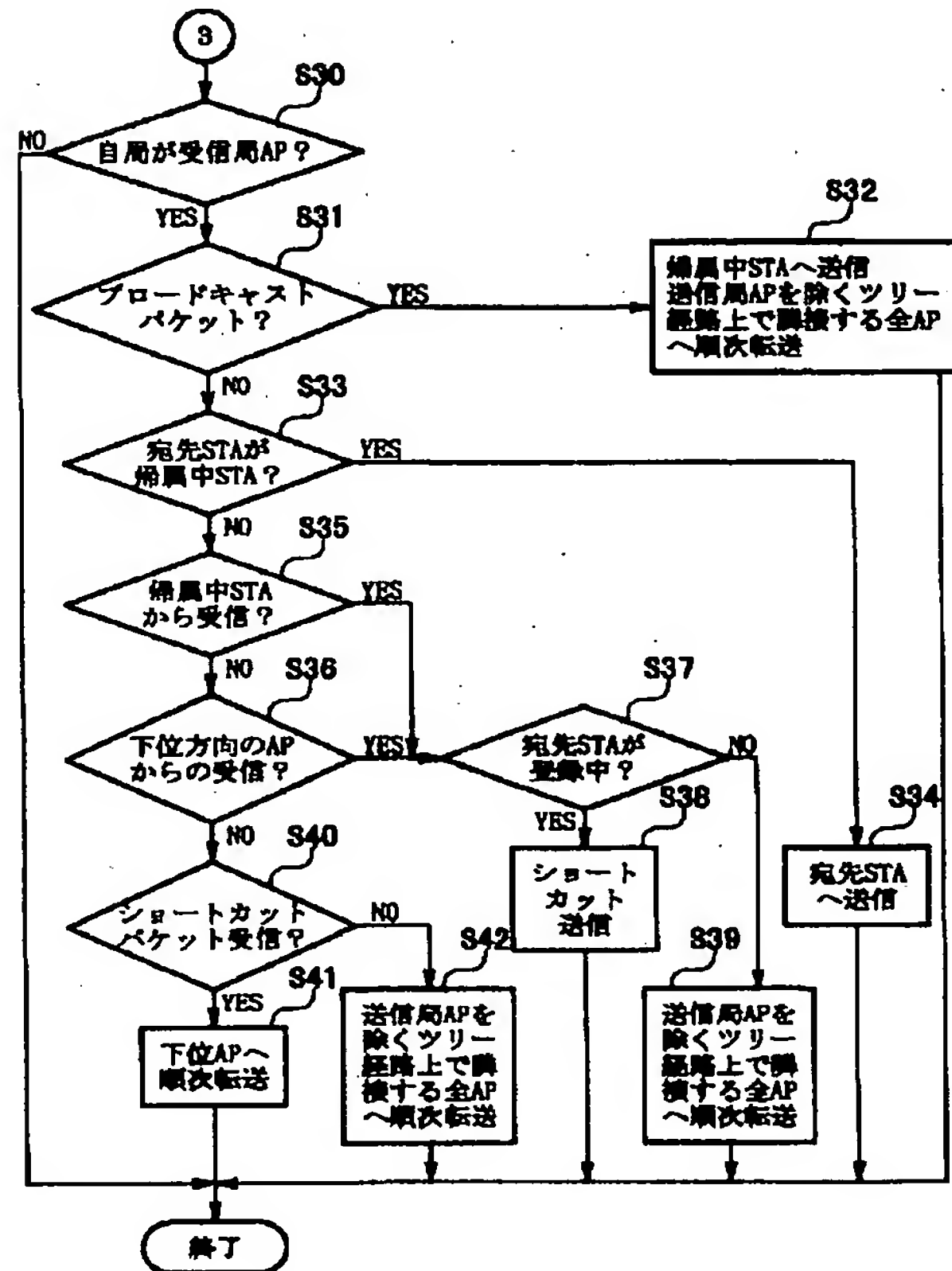
【図2】



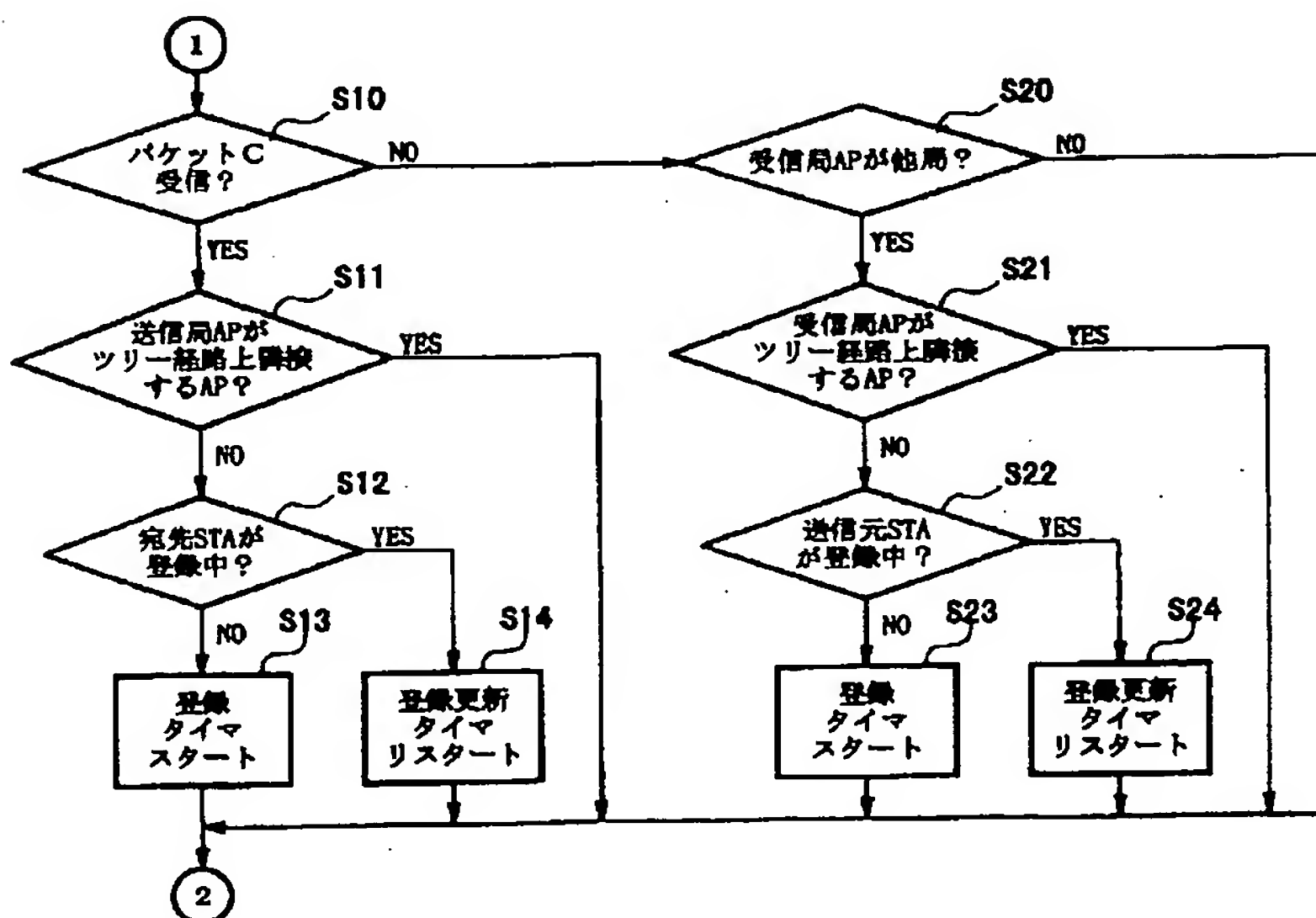
【図3】



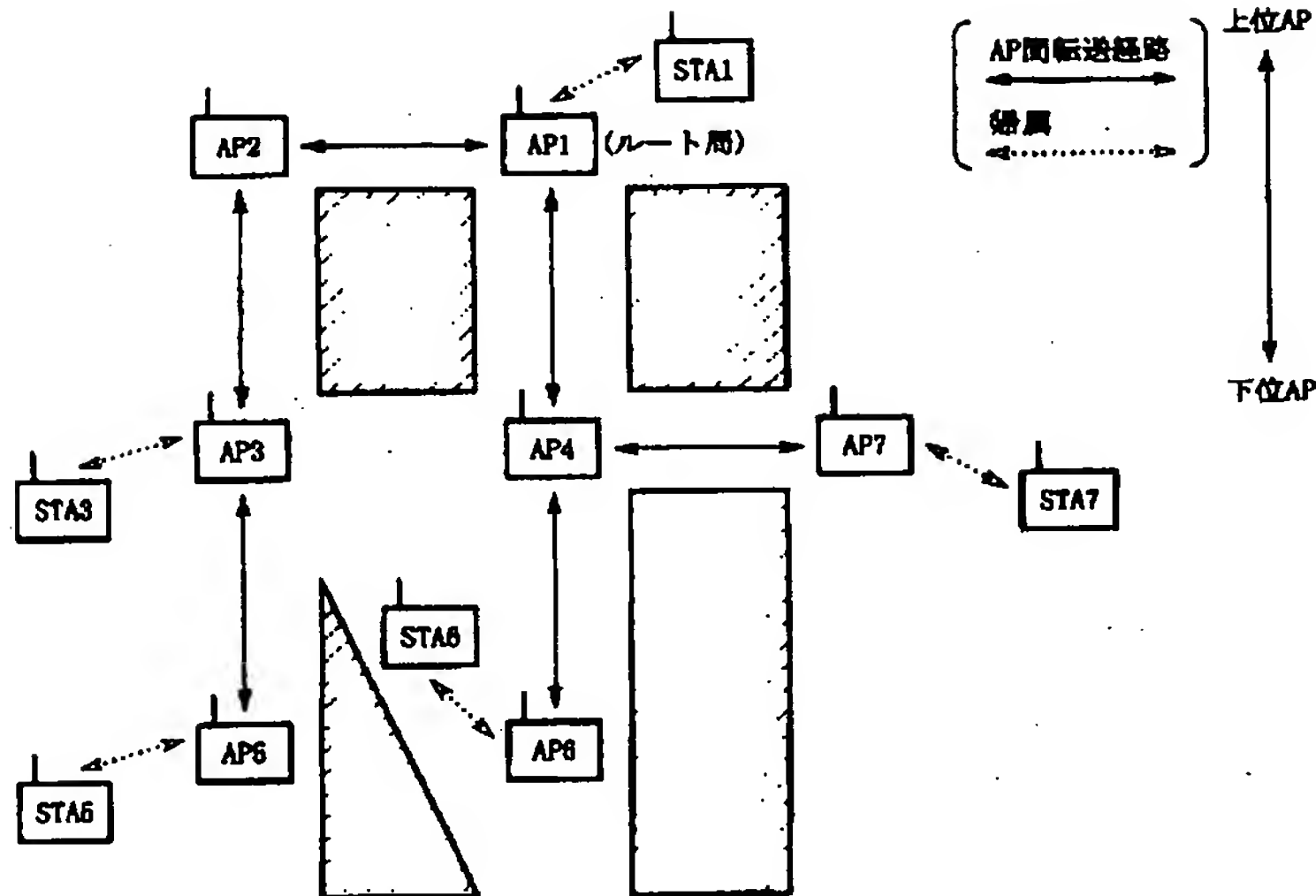
【図5】



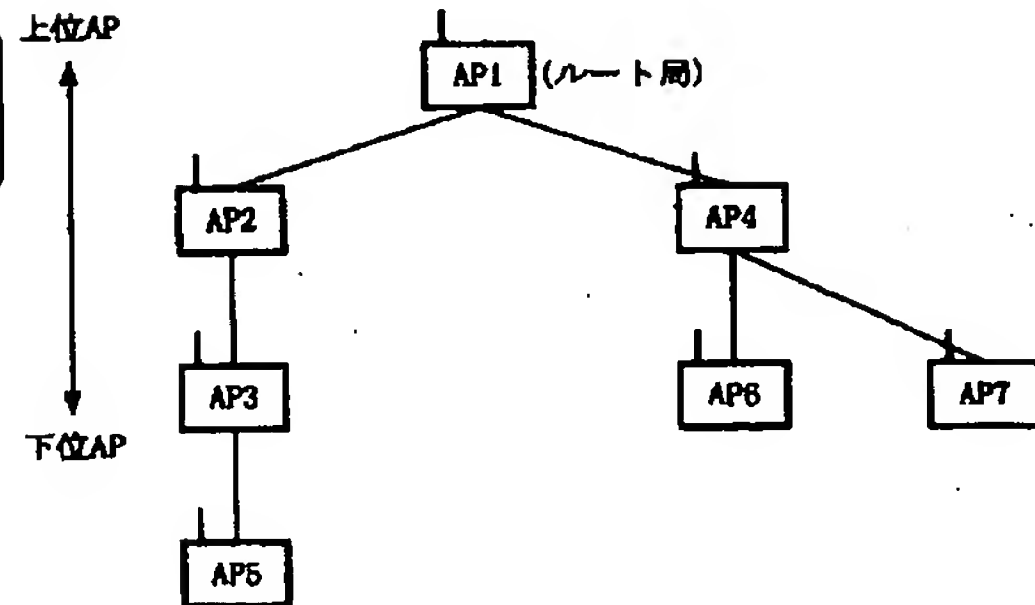
【図4】



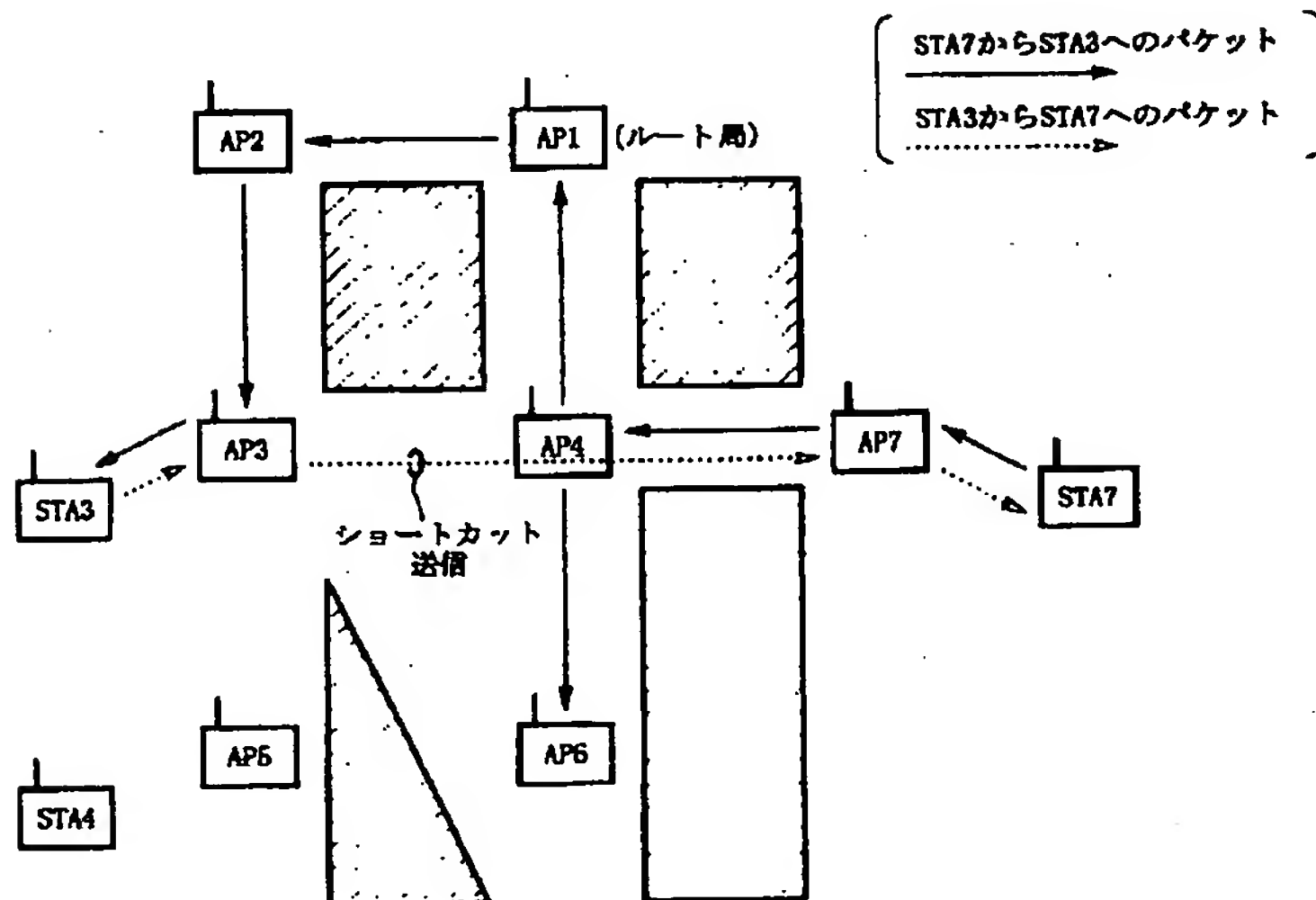
【図7】



【図8】



【図9】

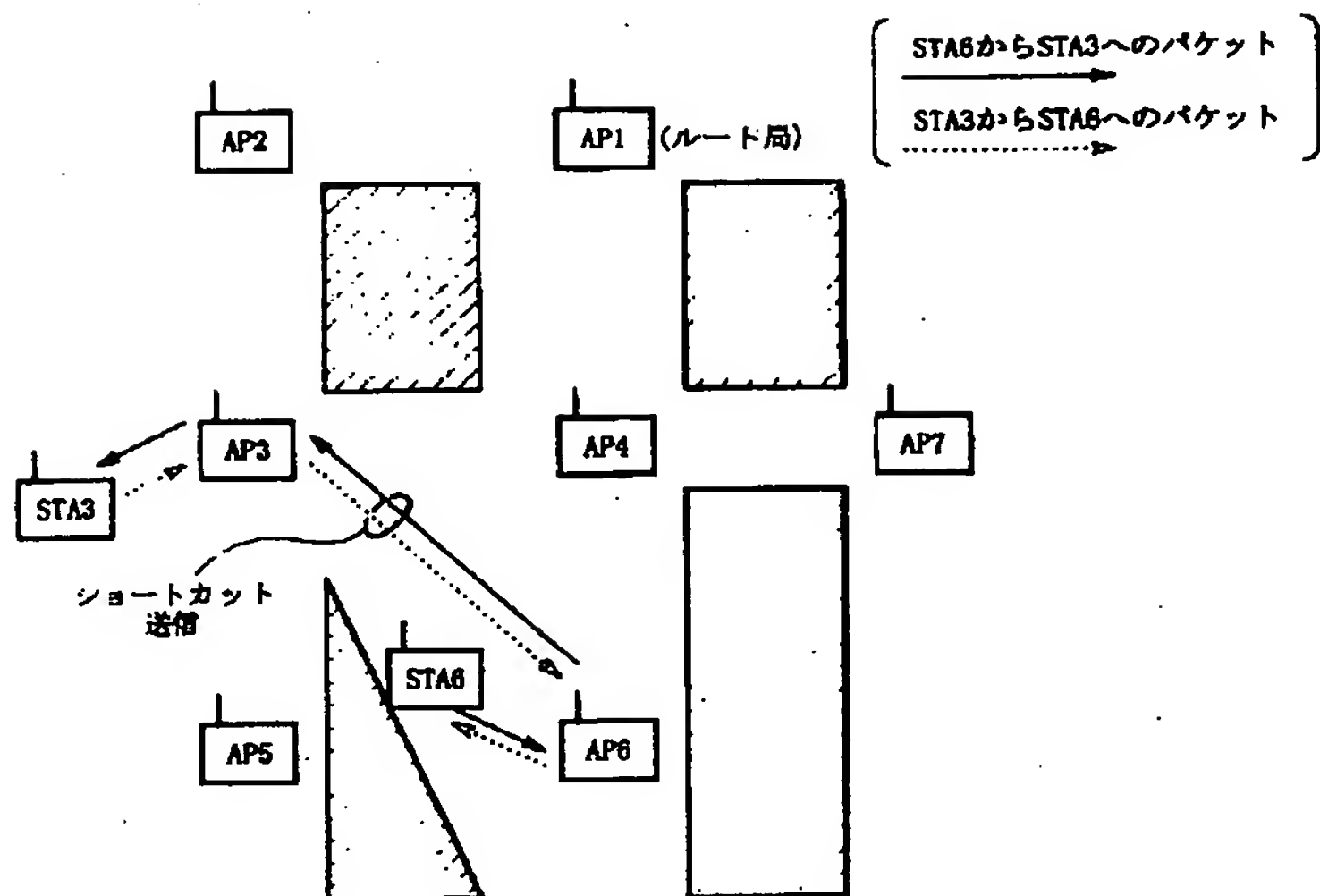


【図10】

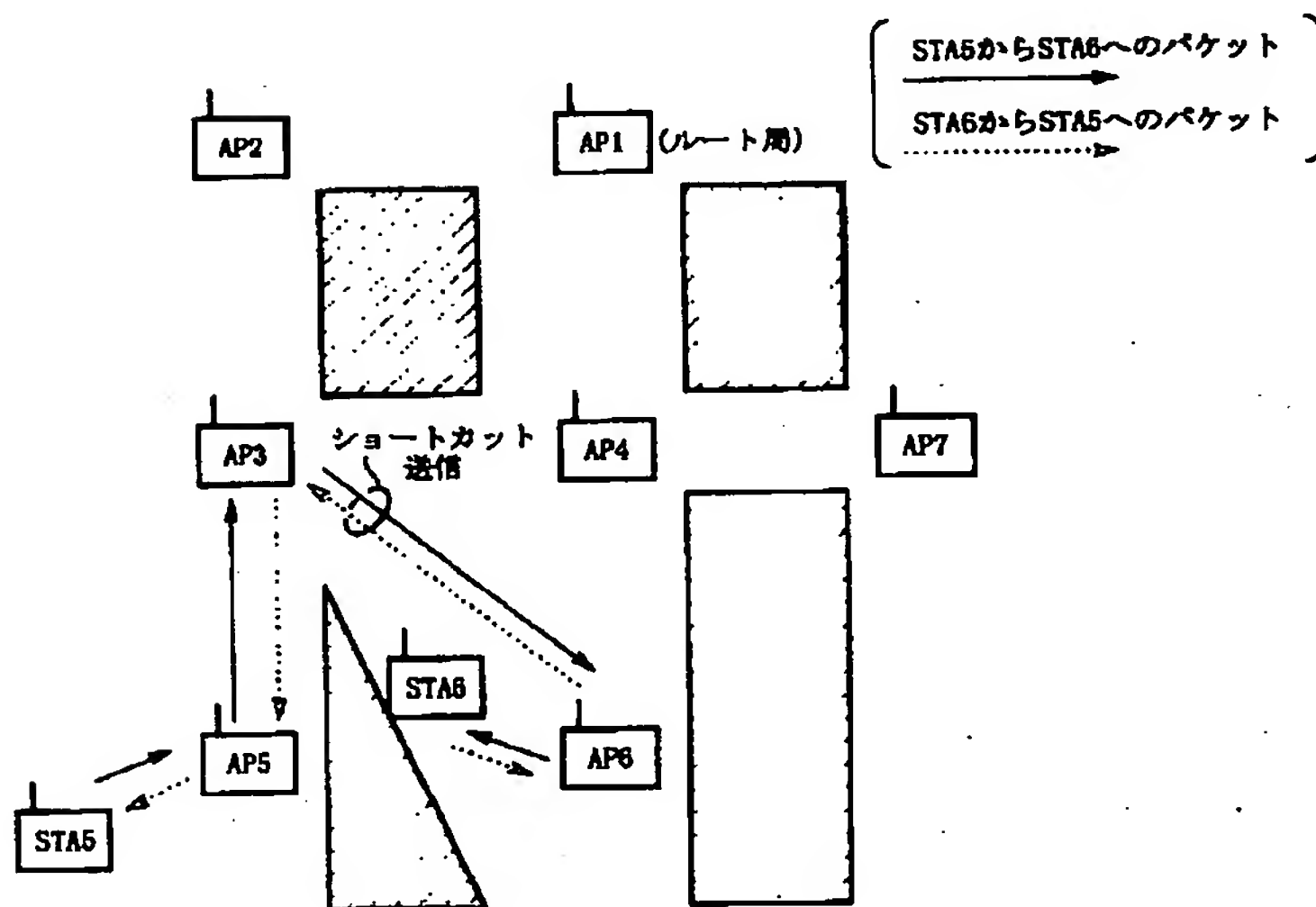
AP3		AP4		AP6		AP7		AP3		AP4		AP7		AP6	
STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス
STA7	AP7	STA3	AP3	STA3	AP3	STA3	AP3	STA7	AP7	STA3	AP3	STA3	AP3	STA3	AP3
								STA6	AP6						

【図12】

【図11】



【図13】



【図14】

AP3		AP4	
STA アドレス	転送先 アドレス	STA アドレス	転送先 アドレス
STA7	AP7	STA3	AP3
STA6	AP6	STA5	AP3

AP7	
STA アドレス	転送先 アドレス
STA3	AP3
STA5	AP3

AP6	
STA アドレス	転送先 アドレス
STA3	AP3
STA5	AP3

AP3	
STA アドレス	転送先 アドレス
STA7	AP6
STA6	AP6

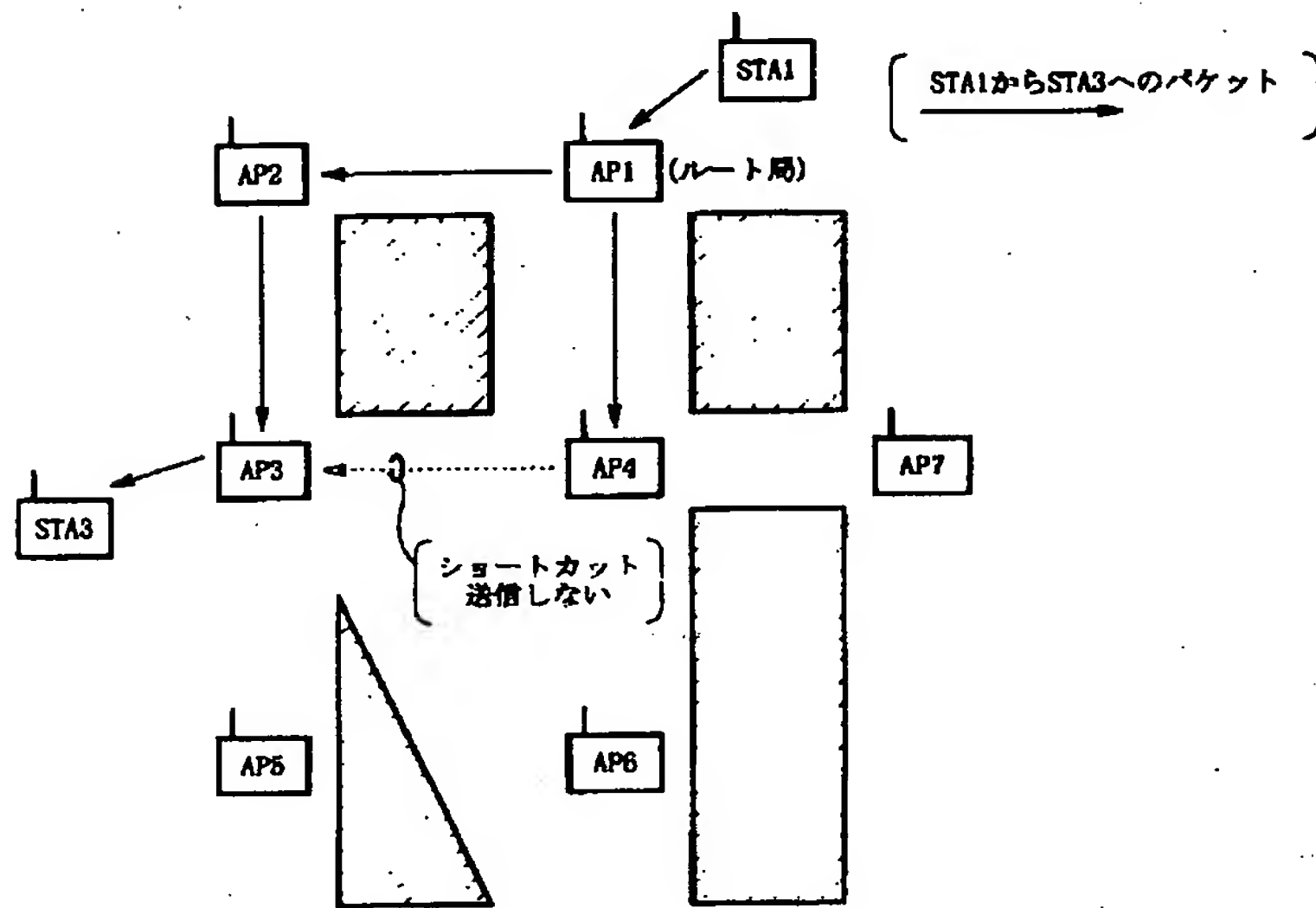
AP4	
STA アドレス	転送先 アドレス
STA3	AP3
STA6	AP3

AP7	
STA アドレス	転送先 アドレス
STA3	AP3
STA5	AP3

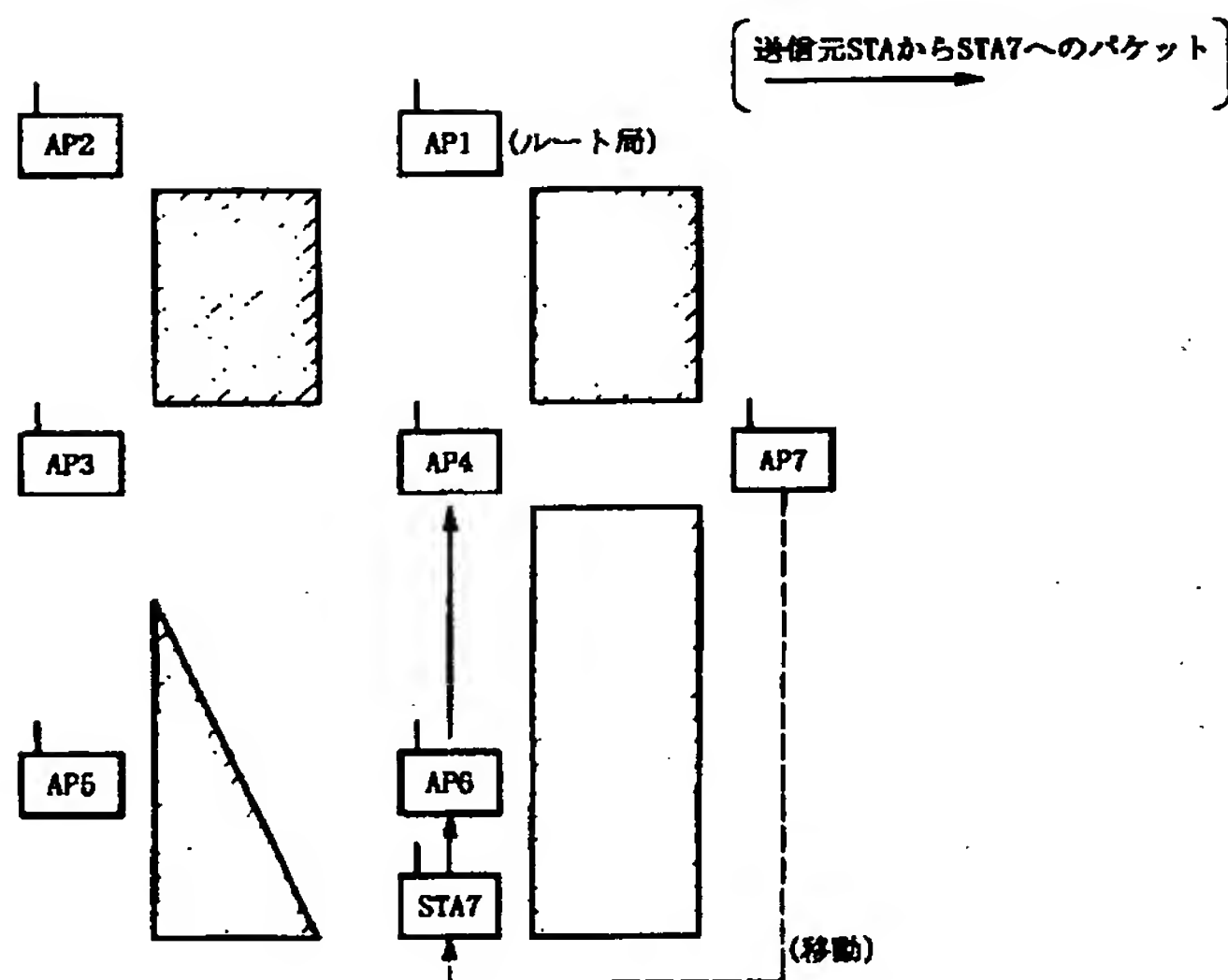
AP6	
STA アドレス	転送先 アドレス
STA3	AP3
STA5	AP3

【図17】

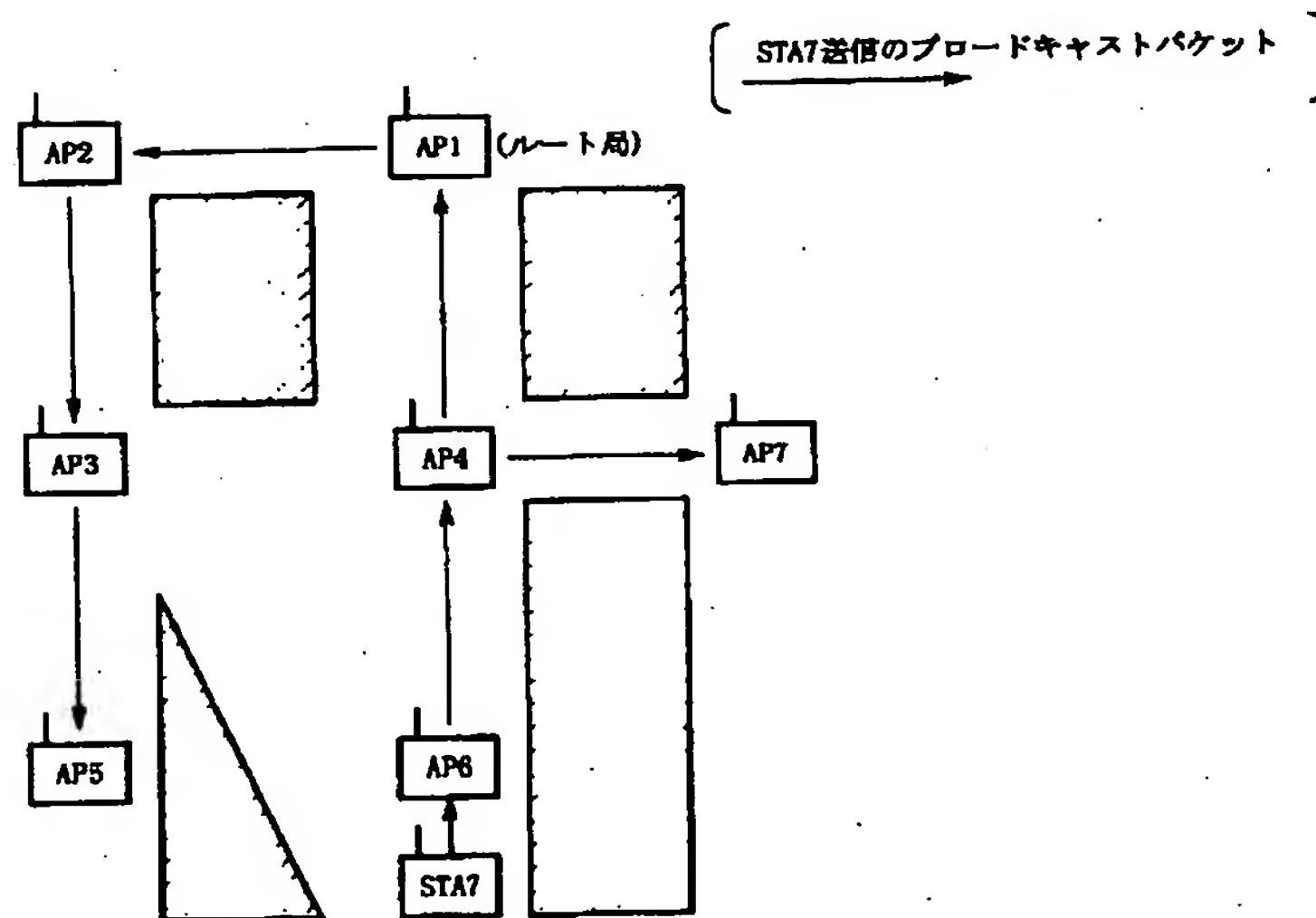
【図15】



【図16】



【図18】



フロントページの続き

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